PROCEEDINGS

OF THE

GENERAL MEETINGS FOR SCIENTIFIC BUSINESS

OF THE

ZOOLOGICAL SOCIETY

OF LONDON,

FOR THE YEAR

1891.

PART I.

CONTAINING PAPERS READ IN

JANUARY AND FEBRUARY.

JUNE 1st, 1891.

PRINTED FOR THE SOCIETY,
SOLD AT THEIR HOUSE IN HANOVER SQUARE.

LONDON:
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PATERNOSTER-ROW.

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LIST OF CONTENTS.

PART I.—1891.

January 6, 1891.

January 20, 1891.

Contents continued on page 3 of Wrapper.

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LIST

OF THE

COUNCIL AND OFFICERS

OF THE

ZOOLOGICAL SOCIETY OF LONDON.

1891.

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(*Elected April* 29, 1891.)

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LIST

OF THE

CONTRIBUTORS,

With References to the several Articles contributed by each.

ERRATA ET EMENDANDA.

Page 72, line 7, *for* "primrose" *read* "pruinose."
 ,, 72, line 33, *for* "dorsal" *read* "discal."
 ,, 81, at foot, after "(1887)" *insert* "Otiembora (November–December) and Okavango River (December). Three female examples."
 ,, 89, footnote, line 2, *for* "occasional" *read* "seasonal."
 ,, 631, line 1, *for* "Ophiomorous" *read* "Ophiomorus."

LIST OF PLATES.

1891.

LIST OF WOODCUTS.

1891.

THE ZOOLOGICAL SOCIETY OF LONDON.

This Society was instituted in 1826, under the auspices of Sir Humphrey Davy, Bart., Sir Stamford Raffles, and other eminent individuals, for the advancement of Zoology and Animal Physiology, and for the introduction of new and curious subjects of the Animal Kingdom, and was incorporated by Royal Charter in 1829.

During the period which has elapsed since the opening of the Gardens in the Regent's Park in 1828, a very large number of species of Mammals, Birds, and Reptiles has been obtained, detailed lists of which will be found in the published Catalogues of the Collection. To these were added, in 1849, collections of Fishes and of the Lower Aquatic Animals, both marine and freshwater, and in 1881 a House for the breeding and exhibition of Insects and other Articulata.

The Society consists of Fellows, and Honorary, Foreign, and Corresponding Members, elected according to the Bye-Laws.

The Gardens in the Regent's Park are open from Nine o'clock A.M. till Sunset; and the Offices and Library (3 Hanover Square, W.), where all communications should be addressed, from Ten till Five, except on Saturdays, when they close at Two o'clock P.M.

The Meetings of the Society for General Business are held at the Office on the Thursday following the third Wednesday in every month of the year, except in September and October, at Four P.M.

The Meetings for Scientific Business are held at the Office twice a month on Tuesdays, except in July, August, September, and October, at half-past Eight o'clock P.M.

The Anniversary Meeting is held on the 29th April, at Four P.M.

TERMS FOR THE ADMISSION OF FELLOWS.

FELLOWS pay an Admission Fee of £5, and an annual Contribution of £3, due on the 1st of January, and payable in advance, or a Composition of £30 in lieu thereof; the whole payment, including the Admission Fee, being £35.

FELLOWS elected after the 30th of September are not liable for the Subscriptions for the year in which they are elected.

PRIVILEGES OF FELLOWS.

FELLOWS have Personal Admission to the Gardens with Two Companions daily, upon signing their names in the book at the entrance gate.

FELLOWS of the Society receive a Book of Saturday, and a Book of Sunday Orders. These Orders admit *two* persons to the Gardens on each Saturday and *two* on each Sunday in the year. But the Saturday Orders are *not* available if the FELLOW uses his privilege of *personally* introducing two companions on the *same day*.

FELLOWS, if they wish it, can exchange the Book of Saturday Orders for Twenty Tickets, available for any day *during the year of issue.* The Book of Sunday Orders can also be exchanged for a similar packet of Twenty Tickets. These tickets will admit only one person, whether child or adult.

Fellows also receive Twenty Free Tickets, each valid for the admission of one adult any day of the week including Sunday, or Forty similar Tickets, each valid for the admission of one child (under Twelve Years of age) any day of the week, including Sunday. These Tickets, if not made use of in the year of issue, are available for following years.

The Books of Orders and the Free Tickets are sent to all Fellows who shall have given a General Order for their delivery, on the 1st of January in every year, at any specified address. Forms for this purpose are supplied on application.

The Wife of a Fellow can exercise all these privileges in his absence.

Fellows have the privilege of receiving a complete set of the Society's Publications on payment of the additional Subscription of One Guinea every year. This Subscription is due upon the 1st of January and must be paid before the day of the Anniversary Meeting, after which the privilege lapses. Fellows are likewise entitled to purchase the Transactions and other Publications of the Society at 25 per cent. less than the price charged to the public. A further reduction of 25 per cent. is also made upon all purchases of Publications issued prior to 1871, if above the value of Five pounds.

Fellows also have the privilege of subscribing to the Annual Volume of the Zoological Record for a sum of £1, payable on the 1st July in each year, but this privilege only holds good if the subscription is paid before the 1st of December following.

Fellows may obtain, on the payment of One Guinea annually, an Ivory Ticket, which will admit a named person of their immediate family, resident in the same house with them, to the Gardens with One Companion daily.

They may also obtain a Transferable Ivory Ticket admitting Two Persons, available throughout the whole period of Fellowship, on payment of Ten Pounds in one sum. A second similar ticket may be obtained on payment of a further sum of Twenty Pounds.

Any Fellow who intends to be absent from the United Kingdom during the space of one year or more, may, upon giving to the Secretary notice in *writing*, have his name placed upon the "dormant list," and will be thereupon exempt from the payment of his annual contribution during such absence.

Any Fellow, having paid all fees due to the Society, is at liberty to withdraw his name upon giving notice in *writing* to the Secretary.

Persons who wish to become Fellows of the Society are requested to communicate with the undersigned.

PHILIP LUTLEY SCLATER, M.A., Ph.D., F.R.S.,
Secretary.

3 Hanover Square, W.,
June 1st, 1891.

The LIBRARY (under the superintendence of Mr. F. H. Waterhouse, Librarian) is open from 10 a.m. to 5 p.m.; on Saturdays to 2 p.m. It is closed in the month of September.

PROCEEDINGS

OF THE

GENERAL MEETINGS FOR SCIENTIFIC BUSINESS

OF THE

ZOOLOGICAL SOCIETY OF LONDON.

January 6, 1891.

Prof. Alfred Newton, F.R.S., Vice-President, in the Chair.

The Secretary read the following report on the additions to the Society's Menagerie during the month of December 1890:—

The registered additions to the Society's Menagerie during the month of December 1890 were 62 in number. Of these 52 were acquired by presentation, 2 by purchase, 1 by exchange, 2 were born in the Gardens, and 5 were received on deposit. The total number of departures during the same period, by death and removals, was 81.

Mr. Sclater exhibited some sketches made by Lieut. W. E. Stairs, R.E., of the horns of a large Antelope, apparently unknown to science, which had been met with by the Emin-Pasha Relief Expedition in the forest-district of the Aruwimi. When the Antelope was first mentioned to him by Lieut. Stairs, Mr. Sclater supposed it might be the *Antilope triangularis* lately described by Dr. Günther (P. Z. S. 1889, p. 74). On calling Lieut. Stairs's attention to this figure and description, he sent the following remarks in reply:—

"The drawings of the horns of *Antilope triangularis* in the 'Proceedings' bear but very little resemblance to those of the Antelope I spoke of. The description is also evidently not that of the animal in question. The length of horns of my Antelope, judging from three different specimens, would average about 26 inches. The horns are *brown*, not black, or, more strictly speaking, are of the colour of dark gelatine. I have only seen the horns and skin. The latter is of a blackish blue, of about the same shade as that of the ordinary African Buffalo.

"I found the first horns of this Antelope at the junction of the Nepoko and Aruwimi Rivers, some 200 miles from the outside of

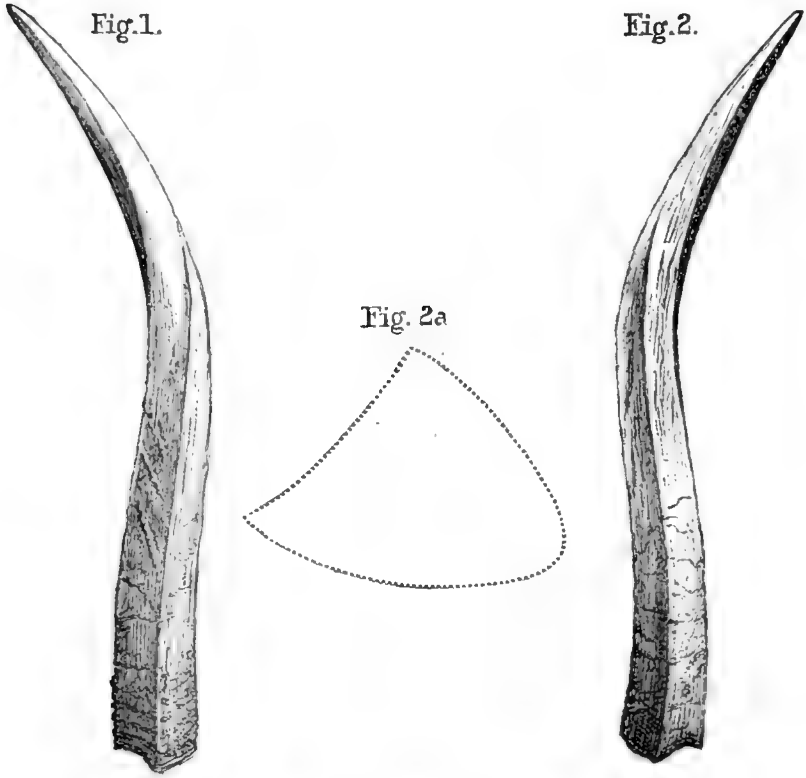


Fig. 1. Left horn of Antelope (front view),
Fig. 2. Right horn of Antelope (front view).
Fig. 2*a*. Section through horn, just above base.

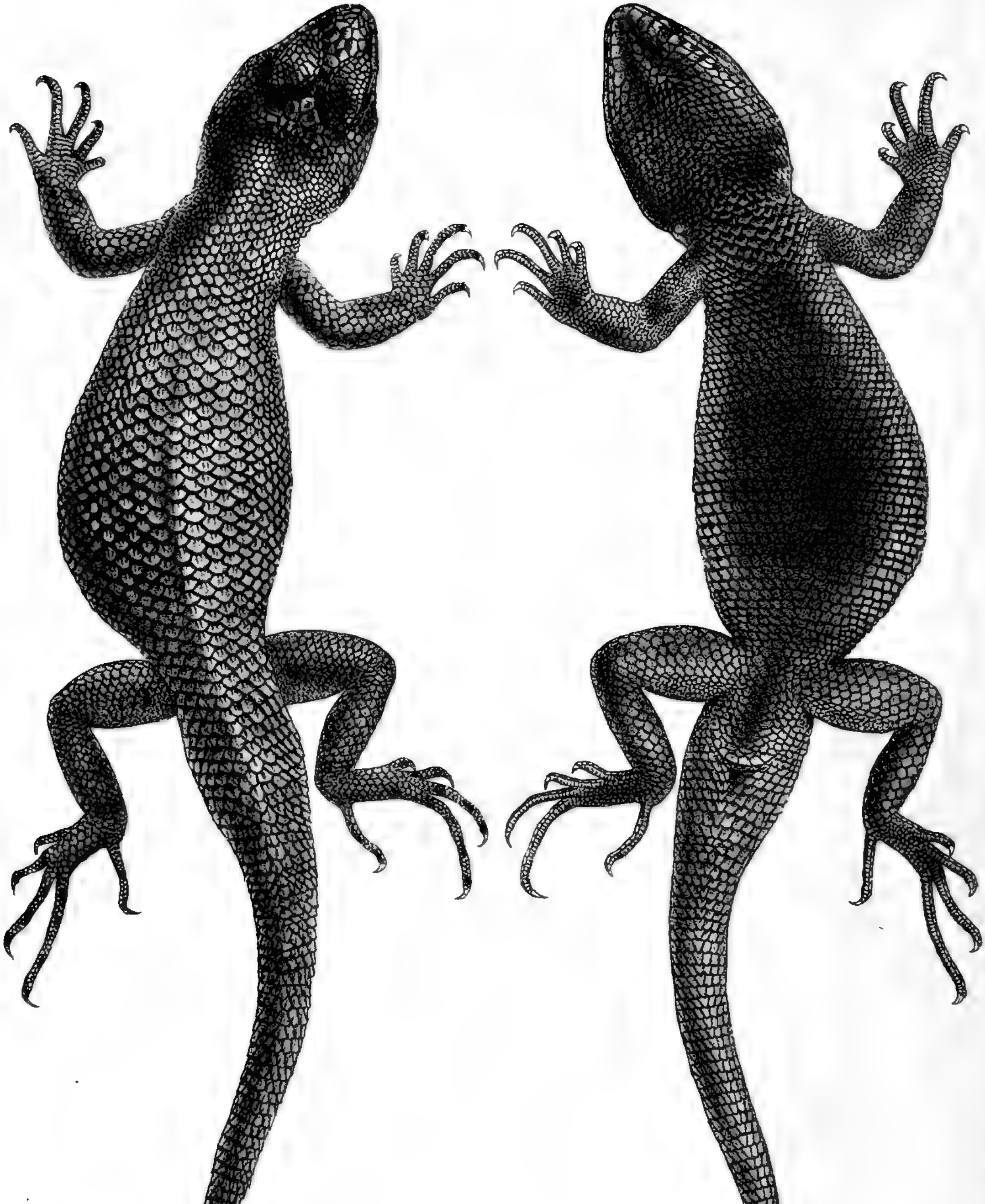
the Big Forest. I met with them again about 20 marches east of that point. I believe this Antelope lives in the forest and never goes on the plains.

"I have frequently talked to natives about it, and at Nepoko was told that it was much bigger than Mr. Stanley's donkey, which stood, as far as I can recollect, about 13 hands 3 inches.

"The hair on the skin was *silky* and *soft*, not harsh as with an ordinary Antelope.

"There are series of rings near the base of the horn, each ring about 2 inches apart. The horn is almost round at the tip.

"The native names for this Antelope are (i) Ati, (ii) Ikuma. The



Peter Smit del. et lith.

Mintern Bros. imp.

CTENOBLEPHARIS JAMESII.

first is the name by which it is known near the junction of the Nepoko and Aruwimi Rivers; and the second is the name given to it by the dwarfs or Wambutti who reside between the Nepoko and Aruwimi as far east as Fort Bode, and south of Fort Bode for at least some 4 dāys."

Mr. Sclater observed that the Antelope thus indicated probably belongs to a new species of the Tragelaphine series.

The following papers were read:—

1. Description of a new Lizard of the Genus *Ctenoblepharis*, from Chili. By G. A. Boulenger.

[Received November 1, 1890.]

(Plate I.)

Ctenoblepharis jamesi, sp. nov.

Shape of the head and general proportions same as in *C. adspersus*, Tschudi, but palpebral fringe less developed and dorsal scales larger. A single series of small shields between the orbits (two in *C. adspersus*); five series of supraocular scales, the series next but one to the interorbital shields transversely enlarged; an elongate suborbital shield, separated from the labials by one series of scales; nine or ten upper labials (seven in *C. adspersus*). Dorsal scales transversely oval subrhomboidal, slightly imbricate, nearly twice as large as the ventrals; lateral scales smallest and separated from one another by minute granules; ventral scales imbricate; 52 scales round the middle of the body, 46 from occiput to base of tail. The hind limb reaches the shoulder. Six anal pores. Upper caudal scales obtusely keeled. Pale olive above, the skin between the scales black; lower parts plumbeous grey, throat and middle of belly blackish.

	millim.		millim.
Total length	190	Fore limb	47
Head	23	Hind limb	66
Width of head	20	Tail (end lost)	90
Body	77		

A single male specimen of this Lizard was obtained in the Province of Tarapacá, Chili, at an altitude of from 10,000 to 12,000 feet, by Mr. A. A. Lane, and presented to the British Museum by Mr. H. Berkeley James, F.Z.S.

It is figured in the accompanying drawing (Plate I.), of the natural size, upper and lower view.

2. On some Chelonian Remains preserved in the Museum of the Royal College of Surgeons. By G. A. Boulenger.

[Received December 8, 1890.]

In the course of a recent examination of the osteological material preserved in the Museum of the Royal College of Surgeons, I have come across a few interesting specimens of extinct and fossil Chelonians, hitherto overlooked or wrongly interpreted, which Professor Stewart has most kindly placed at my disposal for description.

1. *On the Skull of an extinct Land-Tortoise, probably from Mauritius, indicating a new Species* (Testudo microtympanum).

A skull without mandible, from the Hunterian Collection (no. 1058), differs considerably from that of any of the gigantic Land-Tortoises hitherto described. As it comes nearest to *Testudo triserrata*, Gthr.[1], an extinct form from Mauritius, we may assume, in the absence of any information as to its origin, that it probably came from that or some neighbouring island. *T. triserrata* is the only species of *Testudo* known to possess two median ridges on the alveolar surface of the maxillary, and this character is shown on the skull for which the name *T. microtympanum* is proposed, in allusion to the very small tympanic cavity, which is one of its principal distinctive features. Another important distinction is to be found in the great backward prolongation of the palatines and vomers, the latter bone forming a suture with the basisphenoid.

The following is a description of this interesting skull:—

	millim.
Total length to extremity of occipital crest	135
Length to extremity of occipital condyle	102
Greatest width	98
Diameter of orbit	33
Interorbital width	45
Greatest diameter of tympanum	21

Frontal region convex; interorbital width greater than diameter of orbit; præfronto-frontal suture oblique, extending beyond the middle of the upper border of the orbit; suture between the præfrontals not quite half as long as that between the frontals; only the anterior half of the parietals forms a flat surface, and the sagittal suture is all but obliterated. Postorbital arch rather slender, narrower than the zygomatic, which is formed by the postfrontal, the jugal, and the quadratojugal; postfrontal in contact with quadratojugal. Tympanum small, its greatest (vertical) diameter only about two-thirds the diameter of the orbit. Maxillary with

[1] A. Günther, 'The Gigantic Land-Tortoises (Living and Extinct) in the Collection of the British Museum' (1877), p. 44, pl. xxii. fig. A.

strongly dentate edge, the first cusp strongest and at the junction of the maxillary with the præmaxillary; the broad alveolar surface with two denticulated ridges or series of tubercles, exactly as in *T. triserrata*. Palatal region but moderately concave, and with a

Fig. 1.

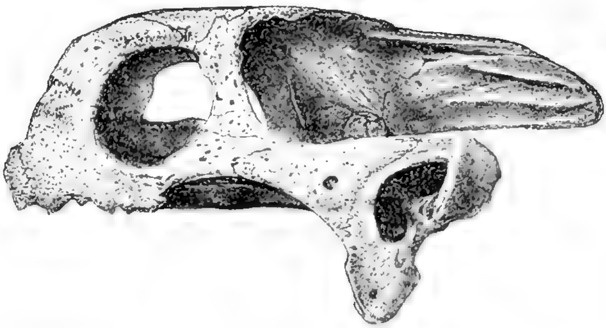


Fig. 2.

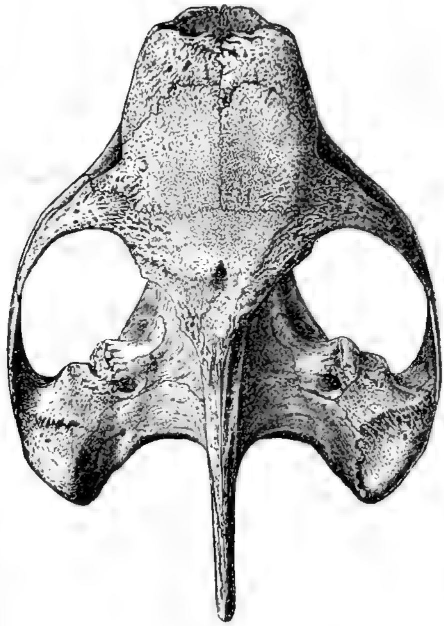
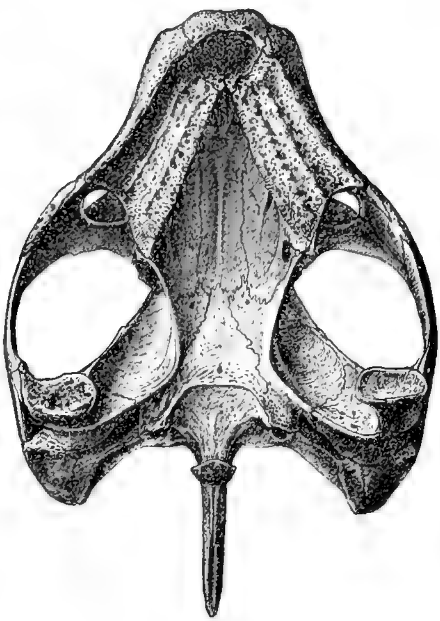


Fig. 3.



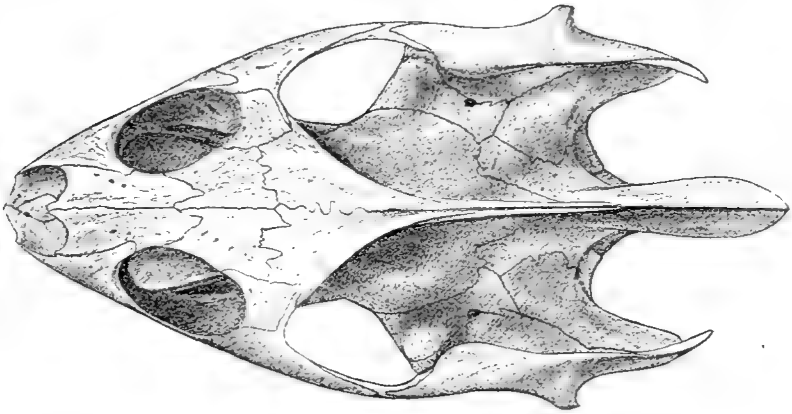
Skull of *Testudo microtympanum*. $\frac{1}{4}$ nat. size.

very feeble keel along the anterior two thirds of the vomer; this bone is very much elongate, extending posteriorly as far as the palatines, and forming a suture with the basisphenoid, thus completely separating the pterygoids from each other.

2. *On a* Trionyx-*skull from the Upper Eocene of Hordwell, Hampshire.*

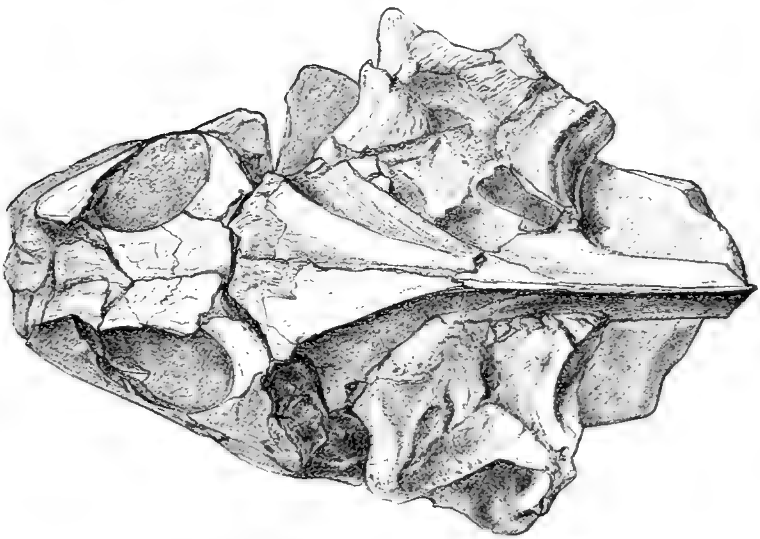
I was very much pleased to find among some unnamed fossils from Hordwell, presented by Alex. Pytts Falconer in 1850, an excellent skull of *Trionyx*, which is the more valuable from the fact that, so far

Fig. 4.



Skull of *Trionyx hurum.* Nat. size.

Fig. 5.



Skull of *Trionyx planus* (?). Nat. size.

as is known to me, no skull of *Trionyx* has yet been described from these beds. It affords conclusive evidence that the English Eocene shells and mandibles referred to *Trionyx* belong to that genus *sensu stricto*, and further corroborates Mr. Lydekker's statement that a mandible from Hordwell in the British Museum (Cat. Foss. Rept. iii.

p. 15, R. 1499) comes nearest the existing *T. hurum*, Gray; for the skull which I now exhibit agrees in almost every respect with that of the Indian *T. hurum*, of which a specimen of the same size (half-grown) is figured for comparison (fig. 4). This is very remarkable, species of Trionychoids being so well characterized by their skulls; and had the fossil been obtained from the Pleistocene of India, I should have unhesitatingly pronounced it to belong to *T. hurum*.

Four species appear to be well distinguished, from their shells, in the Hordwell beds, viz.:—*T. barbaræ*, Ow., *T. henrici*, Ow., *T. incrassatus*, Ow., and *T. planus*, Ow., the latter species being only known from the posterior portion of the carapace. It is just to this species that I should feel inclined to refer the skull, as it is the only one which, in the coarse sculpture of its dorsal plates, at all approaches the existing *T. hurum*; and I am pleased to find that Mr. Lydekker expresses the view that the mandible alluded to above may possibly be referable to *T. planus*. It is, however, not possible to ascertain whether in the species with very coarse sculpture of the dorsal shield (*T. planus*) two neural plates instead of one are present between the first pair of costals, as in the Indian group to which *T. hurum* belongs; let us hope that future finds may settle this point.

In the meanwhile, this fossil skull (see fig. 5, p. 6), may be provisionally referred to *T. planus*, Owen.

3. *On a Humerus of* Eosphargis gigas, *Owen, from the London Clay of the Isle of Sheppey, Kent.*

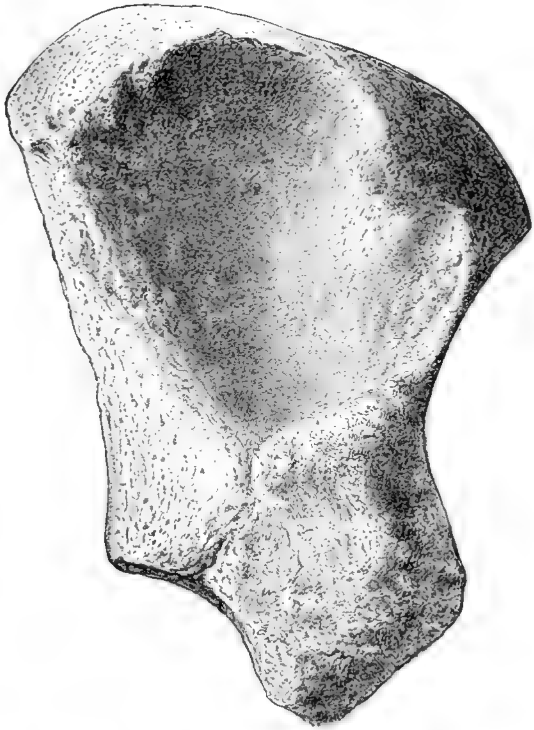
The proximal end of the left humerus of an Athecan Turtle from the London Clay (Lower Eocene) of Sheppey, presented by J. Wickham Flower, is preserved in the Museum of the College of Surgeons, and was described by Owen (Descr. Cat. Foss. Rept. 1854, p. 3) as "the lower or distal end of the tympanic bone of the *Crocodilus toliapicus*[1]; it exceeds in size the corresponding part of the largest recent Crocodiles in the Hunterian Collection"[2]. This specimen may be safely referred to Lydekker's *Eosphargis gigas*, Ow., but belongs to an individual considerably smaller than any on record, the greatest diameter of the proximal end of the humerus being only

[1] On this occasion, I would observe that *C. toliapicus*, Ow. (= *C. spenceri*, Buckl., = *C. champsoides*, Ow.), is no true *Crocodilus*, as it differs in its dental formula $\left(\frac{21-22}{19-20}\right.$, *Crocodilus* having $\left.\frac{17-19}{15}\right)$, the absence of a pointed process on the free border of the quadratojugal, and the large size of the mandibular vacuity, in all these characters agreeing with *Diplocynodon*, to which genus the British Upper Eocene and Oligocene Crocodile *Alligator hantoniensis*, Wood (=*Crocodilus hastingsiæ*, Ow.), belongs. I regard *Diplocynodon spenceri* and *D. hantoniensis* as standing in the same relation to each other as the recent *Crocodilus intermedius* and *C. palustris*. We therefore know of no British Eocene or Oligocene *Crocodilus*, the remains hitherto referred to that genus belonging to *Diplocynodon*.

[2] Two other fossils are referred by Owen (*l. c.*) to the same Crocodile. His "portion of the left ramus of the lower jaw" I regard as a portion of scapula of *Eosphargis*; and his "another portion of the right ramus of the lower jaw" belongs to a Liassic Plesiosaurian.

88 millimetres. Owing to the less advanced age of the specimen, the notch between the head and the external tuberosity does not exist; this notch I also find feebly marked in the skeleton of the not full-grown *Dermochelys coriacea* preserved in the British Museum. The fossil specimen is broken just above the radial process, but the outer posterior tubercular prolongation of this process, so characteristic of

Fig. 6.



Proximal portion of left humerus of *Eosphargis gigas*. ½ nat. size.

the Athecæ, is well preserved, and agrees strikingly with the figure of *Psephophorus rupeliensis* given by Dollo [1], with which the type-specimen of *Eosphargis gigas* also agrees, as stated by Lydekker [2].

In *Eosphargis*, as in *Psephophorus rupeliensis*, the intertubercular pit is close to the radial border of the humerus, whilst in *Psephophorus scaldii* and in *Dermochelys* it is nearly equally distant from either border. The whole shape of the humerus of *Psephophorus scaldii* approaches so much nearer to *Dermochelys* that it appears to me questionable whether it is correct to refer *P. scaldii*, in the absence of any information as to the cranial and exoskeletal characters, to the genus *Psephophorus* rather than to *Dermochelys*.

[1] Bull. Mus. Belg. v. 1888, pl. iv. fig. 7.
[2] Cat. Foss. Rept. iii. p. 220.

3. Contributions to the Anatomy of the Kagu (*Rhinochetus jubatus*). By Frank E. Beddard, M.A., Prosector to the Society.

[Received January 6, 1891.]

The structure of the Kagu, so far as it is at present known, has shown it to be a bird which stands in a central position with respect to several groups. It cannot be included in any of the existing families without doing violence to some one of its structural characteristics.

All that is known of the anatomy of this bird refers to external features, to the skeleton, to the viscera, and to a few of its muscles; and opinions as to its affinities, based more or less upon these characters, are varied. There can be no doubt, however, that it stands somewhere in the Ardeogralline group.

With a view to assist in the more accurate placing of *Rhinochetus*, I offer here an account of some of the principal muscles which I have dissected in a specimen that died in the Society's Gardens a a few years since.

The Kagu was described so recently as 1860 by MM. Des Murs and Verreaux [**1**]; but the first account of its anatomy is contained in a short paper by Prof. Parker [**6**] on certain points in the Osteology, expanded later [**7**] into an elaborate description of the entire skeleton. After the publication of these two papers, Dr. Murie contributed to the 'Transactions' of this Society a valuable account [**8**] of the external characters and of the alimentary viscera, comparing the bird in all these matters with *Eurypyga* and with the Boatbill (*Cancroma*). More recently Prof. Garrod has remarked upon the carotids and upon the muscles of the thigh [**19**]. The disposition of the intestinal coils has been described by Dr. Gadow [**16**], while Mr. Seebohm [**9**] has directed attention to a few points in the osteology. I am not acquainted with any other papers that deal with the structure of *Rhinochetus*.

The following is a list of the papers which I have consulted in putting together the present notes:—

(**1**) Des Murs and J. Verreaux.—Revue et Mag. de Zool. t. xiii. (1860) p. 441.

(**2**) Pouget.—Note sur le Kagou. Bull. Sociét. Acclim. (3) t. ii. p. 162. [1]

(**3**) Bartlett, A. D.—Note on the Habits and Affinities of the Kagu (*Rhinochetus jubatus*). P. Z. S. 1862, p. 218.

[1] In this paper the author illustrates, by some good woodcuts, the attitudes of the bird—particularly the elevation of the crest, which I have myself frequently observed at the Gardens. He also points out that the name was written by the describers "*Rhynochetos*," and that therefore, in his opinion, their spelling should be used.

(4) Bartlett, A. D.—Notes on the Breeding of several Species of Birds in the Society's Gardens during the year 1865. P. Z. S. 1866, p. 76.
(5) Bartlett, A. D.—Notes on the Breeding of several Species of Birds in the Society's Gardens during the year 1867. P. Z. S. 1868, p. 114.
(6) Parker, W. K.—On the Osteology of the Kagu (*Rhinochetus jubatus*). P. Z. S. 1864, p. 70.
(7) Parker, W. K.—On the Osteology of the Kagu (*Rhinochetus jubatus*). Tr. Z. S. vol. vi. p. 501.
(8) Murie, J.—On the Dermal and Visceral Structures of the Kagu, Sun-Bittern, and Boatbill. Tr. Z. S. vol. vii. p. 465.
(9) Seebohm, H.—An Attempt to Diagnose the Suborders of the Great Gallino-Gralline Group of Birds by the aid of Osteological Characters alone. Ibis, 1888, p. 415.
(10) Bennett, G.—Letter from. P. Z. S. 1862, p. 84.
(11) Bennett, G.—Letter from. P. Z. S. 1862, p. 107.
(12) Bennett, G.—Notes on the Kagu. P. Z. S. 1863, p. 385.
(13) Beddard, F. E.—On the Structure of *Psophia* and on its Relations to other Birds. P. Z. S. 1890, p. 329.
(14) Beddard, F. E.—A Contribution to the Anatomy of *Scopus umbretta*. P. Z. S. 1884, p. 543.
(15) Fürbringer, M.—Untersuchungen zur Morphologie und Systematik der Vögel. Amsterdam, 1888.
(16) Gadow, H.—Aves, in Bronn's 'Klassen und Ordnungen des Thierreichs,' Bd. vi.
(17) Newton, A.—Article "Ornithology" in 11th ed. of 'Encyclopædia Britannica.'
(18) Sclater, P. L.—Remarks on the present State of the Systema Avium. Ibis, 1880, p. 340 *et seq.* & p. 399 *et seq.*
(19) Garrod, A. H.—Collected Papers. Edited by W. A. Forbes. London, 1861.
(20) Shufeldt, R. W.—The Myology of the Raven. London, 1890.
(21) Weldon, W. F. R.—On some Points in the Anatomy of *Phœnicopturus* and its allies. P. Z. S. 1883, p. 638.
(22) Forbes, W. A.—Collected Papers. Edited by F. E. Beddard. London, 1885.

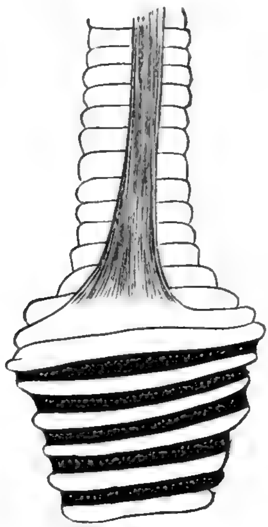
Syrinx.

The syrinx of *Rhinochetus* is displayed in the accompanying drawing (fig. 1, p. 11). It will be seen that it is not specially distinctive, and that it does not afford much help in deciding upon the affinities of the bird. The lateral muscles spread out into a fan-like insertion on to the third bronchial semiring; the 2nd, 3rd, and 4th bronchial semirings are thicker than any of the preceding or succeeding rings. The bronchidesmus is incomplete. The syrinx is not unlike that of the Ardeidæ, but is also like that of *Ocydromus* and other Rail-like birds.

Myology.

The account of the muscular anatomy, which I am able here to offer to the Society, is very far from being complete. My material (a single specimen which had been already partially dissected by one of my predecesors) was not sufficient to permit of an exhaustive description of the muscles. However, in the present state of our knowledge of Avian myology, there are comparatively few muscles which have been shown to have any classificatory importance; concerning most of these I have something to say.

Fig. 1.



Syrinx of *Rhinochetus*, from the side.

At present all that is known about the muscles of *Rhinochetus* is contained in the late Prof. Garrod's well-known paper upon bird classification [**19**], and is therefore restricted to a statement that the ambiens, femorocaudal, semitendinosus, and accessory semitendinosus muscles are present.

I. Muscles of the Fore Limb.—(1) The *Tensor patagii longus* and the *tensor patagii brevis* both have a fleshy origin from the clavicle; close to the commencement of their long tendons of insertion the two muscles are firmly attached to each other by fibrous tissue; near to this point, as is commonly the case, a tendinous slip from the humerus joins the muscles; and there is also a tendinous slip arising from the great pectoral muscle.

The tendon of insertion of the *tensor patagii longus* presents no noteworthy particulars; the tendon of insertion of the *tensor brevis* is extremely complicated; these tendons are connected with a thin aponeurotic fascia covering some of the extensor muscles of the fore-arm, and the two inner of the three branches by which the tendon is attached to the tendon of the *extensor metacarpi radialis longus* are prolonged some way beyond that tendon.

There is no tendinous slip uniting the distal end of the tendon of the *tensor patagii brevis* with the tendon of the *tensor patagii longus*.

Neither was there any trace, that I could discover, of a *Biceps slip* running from the *Biceps* muscle to the tendon of the *tensor patagii longus*.

The arrangement of these muscles and tendons is not characteristically like that of any of the allied groups; most of the Geranomorphæ of Prof. Huxley have the Biceps slip, which is, however, absent in Cariamidæ and in the Bustards. I may take this opportunity of mentioning that in the Golden Plover (Forbes MS.) the Biceps slip is tendinous, not muscular. *Eurypyga helias*, generally regarded as a near ally of *Rhinochetus*, has a large Biceps slip [**15**]; I can confirm this by my own dissections.

On the other hand, the Herodiones have no Biceps slip, but the arrangement of the tendons of the *tensores patagii* differs from that of *Rhinochetus* in the presence of a recurrent slip running from the insertion of the *tensor patagii brevis* to the middle of the *tensor patagii longus* tendon. The only birds known to me with which *Rhinochetus* can be usefully compared, which have not this recurrent tendon, are the Rails, *Eurypyga*, and *Cariama*.

(2) The *Rhomboideus superficialis* is a large fleshy muscle with a tendinous origin for the greater part; it is inserted into the entire length of the scapula, with the exception only of a very small portion at the free extremity, also into the clavicle: this muscle is much thicker anteriorly than posteriorly, but thinnest of all in the middle; posteriorly its origin is fleshy, but at the end of the second third of the muscle it begins to have a tendinous origin which increases in breadth anteriorly.

(3) The *Rhomboideus profundus* is as usual of much less extent than the *rhomboideus superficialis*; its origin is tendinous throughout; it is attached along the scapula for about half the length of the bone; the fibres of the muscle run at an acute angle with those of the *rhomboideus superficialis*; at the extremity of the scapula this muscle is not covered by the *superficialis*.

(4) The *Latissimus dorsi*, as usual, is double; the anterior section of the muscle (see fig. 2, *L.d.*1, p. 13) arises from the spine of the last free dorsal vertebra and from the spines of a portion of the succeeding fused mass of vertebræ. It is inserted by a broad fleshy insertion on to the humerus between the biceps and deltoid.

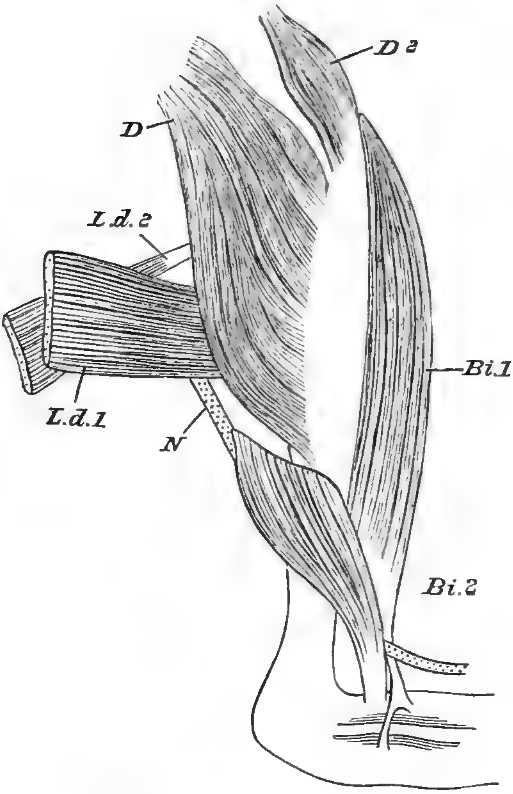
The posterior part of the *latissimus dorsi* (*L.d.*2) is not continuous at its origin with the anterior; it arises from the spines of the fused set of dorsal vertebræ, from the spine of the following vertebra, and also from the edge of the ilium. Its fibres rapidly converge to a tendon which crosses the anterior muscle, running below it, and is inserted on to the humerus above the insertion of the anterior latissimus dorsi in common with the accessory tendon of the anconæus longus.

(5) The *Deltoid* (fig. 2, *D*, *D*², p. 13) is largely developed and

extends about halfway down the humerus, being therefore larger than in the Herons.

(6) The *Anconæus longus* arises from the neck of the scapula by two distinct origins ; one is chiefly fleshy, the other is formed by a short stout tendon and is placed nearer to the free end of the scapula than the other. The muscle is, as has been already mentioned, attached to the humerus by a flat tendon which joins that of the posterior latissimus dorsi. The presence or absence of this tendon

Fig. 2.



Muscles of fore limb of *Rhinochetus.*

D, *D*², deltoid; *L.d.* 1, *L.d.*2, latissimi dorsi ; *Bi.*1, biceps ; *Bi.*2, accessory biceps ; *N*, nerve.

is often a fact worth noting for classificatory purposes. Most of the allies of *Rhinochetus,* however, are provided with the tendon in question.

(7) The *Biceps* (fig. 2, *Bi.*1) arises by two distinct heads, as is so generally the case among birds, by a long slender tendinous head from the coracoid and by a broad fleshy origin from the humerus. Just at its insertion the tendon of the muscle divides into two, one being attached to the radius, the other to the ulna.

(8) In addition to the biceps there was a very remarkable muscle present which I have once before observed; unfortunately I have no note of the bird in which it occurred. This muscle is a kind of *accessory biceps*: it arises from the humerus just below the insertion of the deltoid by a tendinous sheet; in the specimen before me, as shown in the drawing (fig. 2, *Bi.*2, p. 13), the muscle was prolonged forwards, running parallel to the fibres of the deltoid and closely embracing the nerve (*N.*) which supplies this part of the wing; the appearances presented were suggestive of an origin from the sheath of the nerve, which of course seems hardly likely. The muscle gradually diminishes in width as it passes down towards the radius and becomes tendinous, but I did not succeed in making out the exact mode of its insertion.

Dr. Gadow mentions no muscle that can be compared with this.

(9) The *Expansor secundariorum* is present; the tendon is of considerable size; I did not observe its mode of insertion. The *Expansor secundariorum* seems to be present in all the Cranes and Plovers and in most Herodiones; its absence, however, in *Cancroma* and *Egretta* shows that it is on the wane in that group.

(10) The *Triceps* has the usual two heads situated close together just beneath the head of the humerus.

(11) The *Pectoralis primus* has a large insertion area on the crista superior of the humerus; there is no second insertion such as is met with among many birds.

(12) The *Pectoralis secundus* is well developed, and its origin extends back to nearly the end of the narrow sternum.

(13) The *Coraco-brachialis longus* arises from the coracoid near to its articulation with the sternum and also from the sternum itself.

At present there does not exist material for a detailed comparison of the musculature of the forearm and hand in different groups. The work of Dr. Gadow [**16**] upon Bird Anatomy contains a good general account of these muscles with their variations in a few types, while Dr. Shufeldt's essay on the Raven [**20**] and some few papers by other writers deal with these muscles in special forms. Although the object of the present paper is principally systematic, I give an account of the principal muscles of the forearm, since *Rhinochetus* is probably not an accessible type to many of those who are engaged in the study of the muscular anatomy of birds. I have not studied the intrinsic muscles of the hand in my specimen, in the hope that on some future occasion I may have the opportunity of dissecting a recently dead specimen.

When the skin is cut off from the outer side of the forearm, most of the extensor muscles are revealed without further dissection.

(1) *Extensor metacarpi radialis longior.*—This muscle consists of two distinct parts with separate origins but a common insertion: the outer part arises by a thin tendon; this soon expands into a fusiform muscle which is decidedly smaller than the second part of the extensor; the muscle passes into a tendon at a point about half-

way along the radius; soon after this the tendon joins that of the inner head. The inner part of this muscle has a fleshy origin, and it is larger than the outer part of the muscle; its tendon commences nearer to the origin of the muscle than that of the outer head; the combined tendons are inserted on to the metacarpal of digit I.

Dr. Shufeldt, in his careful account of the myology of the Raven, [20], mentions only a single head to this muscle; and the same thing occurs in other birds.

(2) The *Supinator* is a strong muscle attached up to about the middle of the radius; it is not in any way fused with the *extensor communis digitorum,* as I understand it to be in the Raven from Shufeldt's description.

(3) The *Extensor digitorum communis* arises by a distinct tendon from the humerus in common with the supinator; the muscle passes into its tendon of insertion at about the middle of the forearm; the tendon passes round a smooth surface at the distal end of the ulna in common with that of the flexor metacarpi radialis, and is attached to the proximal end of the *first* phalanx of the index, having previously given off a branch to the thumb.

In the Raven, according to Shufeldt, the insertion is on to the second phalanx of the index.

(4) The *Extensor pollicis longus* arises chiefly from the radius, but also from the septum between itself and the anconæus.

(5) The *Extensor indicis longus* is formed of two parts—one head arising from the lower side of the radius near to its distal end, the other from the carpus.

(6) The *Ectepicondylo-ulnaris* is a strong muscle, arising by a tendinous origin from the outer condyle of the humerus; it is inserted along rather more than one half of the ulna.

(7) The *Extensor metacarpi ulnaris* arises from the external condyle of the humerus; closely attached to it is a tendinous sheet connected with the tensor patagii brevis tendon; it is inserted by a long tendon to metacarpus, which arises not far from the wrist-joint.

(8, 9) There are two *pronator* muscles, of which the upper is the larger.

(10) *Flexor digitorum sublimis.*—This muscle is visible when the skin is removed; it is related to a strong tendinous sheet connected with the remiges; the muscle itself is largely covered by the flexor carpi ulnaris; its tendon divides into two, the shorter being attached to the wrist, the longer passing down in company with the tendon of the flexor digitorum profundus.

(11) The *Flexor digitorum profundus* arises from a part of ulna just in front of attachment of brachialis internus; it is for a very short space overlapped by this muscle; it also arises from radius; the tendon ends upon proximal end of last joint of the 2nd finger.

(12) The *Flexor carpi ulnaris* is a very large muscle arising by a strong tendon; the distal extremity of the muscle divides into two tendons—one is short and strong and is attached to the ulnare; the other passes down the index digit and is attached to metacarpal III.

(13) *Rector remigium.*—The tendon of this muscle is inserted on to ulnare close to the insertion of the last-mentioned muscle; its fibres are connected with the remiges and also with the sheath of the *flexor carpi ulnaris.*

(14) The *Flexor metacarpi pollicis* arises from the radius; its tendon is inserted in common with that of the flexor sublimis.

II. Muscles of the Hind Limb.—(1) The *Glutæus maximus* is enormously developed, reaching to the patella and hiding most of the flexors of the thigh.

(2) The *Semimembranosus* (fig. 3, *Sm.*, p. 17) is inserted by a long and thin flat tendon on to the inner side of the tibia, just below the ligament binding this bone to the femur.

(3) The *Semitendinosus* (fig. 3, *St.*) arises from a part of the ilium which is not occupied by the origin of the biceps; it gives off a large and entirely fleshy *accessory semitendinosus* (fig. 3, *A*); between this latter and the main part of the muscle is a diagonally running tendinous raphe, which is visible only on the inferior aspect of the muscle; just at this point the superior surface of the muscle is connected by a short tendon to the gastrocnemius. The insertion of the semitendinosus is effected by a flat thin tendon which joins the tendon of the semimembranosus about half an inch in front of their common insertion upon the inner side of the tibia. In the Herons (in *Nycticorax*, *Cancroma*) and in *Scopus* the semimembranosus is attached by a separate tendon to the tibia [1]; the semitendinosus is not inserted there at all; in *Psophia* the muscles are inserted by a common tendon, in *Ocydromus* by separate tendons.

(4) The *Biceps* is a broad flat muscle which has the usual form and relations; it passes through a tendinous loop as in nearly all birds before its insertion by a stout tendon on to the fibula.

(5) The *Ambiens*, as Garrod has stated [**19**], is present.

(6) The *Femorocaudal* is a slender muscle which narrows suddenly into a thin tendon which is nearly one half of the entire length of the muscle. It arises quite in the usual way from the caudal vertebræ and is inserted on to the lower border of the femur.

(7) There is *no accessory femorocaudal.*

(8) The *Gastrocnemius* arises by four separate heads (woodcut, fig. 3):—the outer head is attached to the femur in common with the outer loop of the biceps sling; the second head is smaller and is formed by a short flat tendon attached to the femur; the third head receives a tendon from the semitendinosus and runs up to the femur in close relations with the accessory semitendinosus, it has an attachment also to the inferior of the two adductor muscles; the fourth head is formed by a broad flat tendon to the head of the fibula.

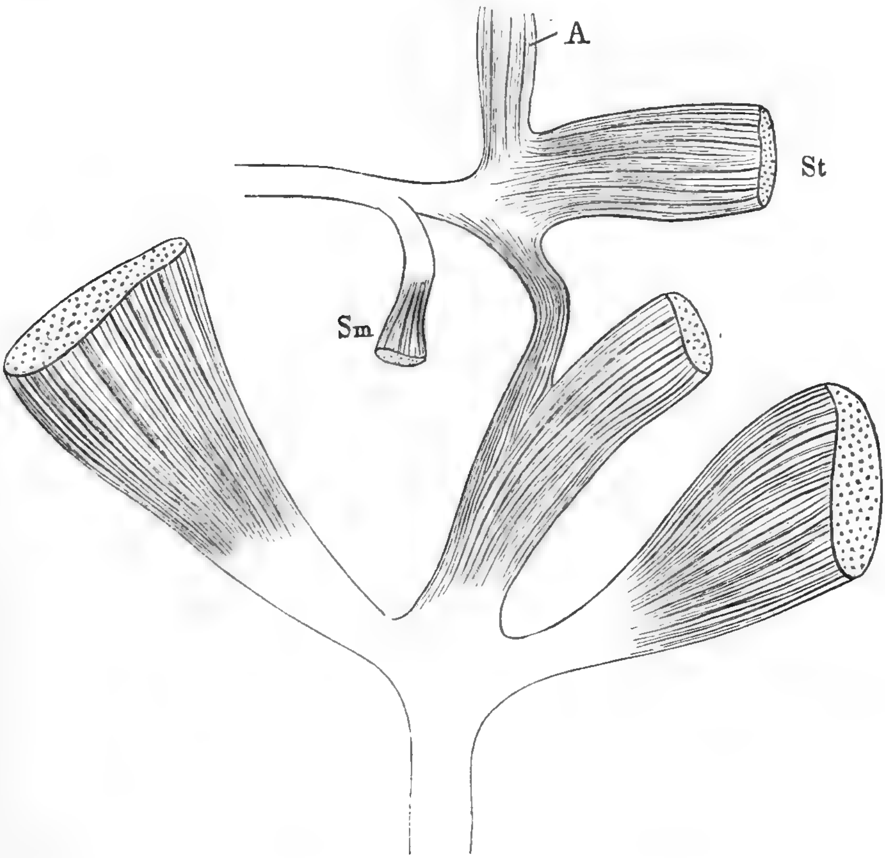
(9) The *Plantaris* is a long muscle with a fleshy origin from the hinder part of tibia just below the internal femoro-tibial ligament; the origin extends as far down as the insertion of the ligament.

(10) The *Peroneus longus* is a very large and strong muscle, the

[1] Mr. Weldon, however, states that in *Phœnicopterus* and the Storks these muscles are inserted in common [**21**, p. 645].

only one visible on an anterior aspect of the tibia; it arises from the crest of the tibia, from the fascia covering the tibialis anticus on its upper part, from the septum between itself and the head of the gastrocnemius, and from that between itself and the extensor communis; its long tendon, as appears to be invariably the case with birds, is attached to that of the flexor perforatus of digit II.

Fig. 3.



Gastrocnemius of *Rhinochetus*, dissected to show its connection with the Semitendinosus.

St, Semitendinosus; *A*, its accessory head; *Sm*, Semimembranosus.

(11) The *Peroneus brevis* arises from the fibula; its tendon passes below that of the peroneus longus and is attached to the metatarsals on the outer side. This muscle is wanting in *Ardea* and *Ciconia*, but is present in *Grus*.

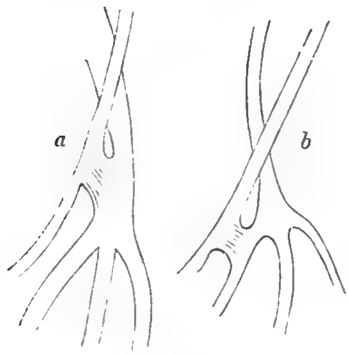
(12) The *Tibialis anticus* lies beneath the *Peroneus longus*; it arises from two heads—the upper and larger from the crest of the tibia, from the fascia covering the knee, and from the septum between

itself and the neighbouring flexor; its tendon runs at first beside and then above that of the extensor communis and is attached to the metatarsus as usual.

(13) The *Extensor communis digitorum* arises from the crest of the tibia and for about two inches of inner half of outer face of the shaft.

(14) *Flexor hallucis longus.*—This muscle arises from the femur by tendon, and from the fascia covering the flexor superficialis near to its origin. Its tendon is connected with that of the flexor profundus digitorum by a vinculum as in the majority of birds. The arrangement belongs to the first type described by Garrod [**19**], which characterizes *Gallus* and a large number of other birds; the vin-

Fig. 4.



Connection between tendons of deep Flexors in *Rhinochetus* (*a*) and *Scopus* (*b*).

culum is of some breadth, and it is attached to the tendon of the flexor communis before the bifurcation of the latter. I find that my description of this tendon in *Scopus umbretta* does not apply to every individual. I there [**14**] described[1] a vinculum as being composed of *two* fibrous bands—one attached before the trifurcation of the tendon of the flexor profundus, the other attached to the branch of this tendon supplying the ɪᴠth digit. A dissection of a specimen which died in the Society's Gardens a day or two since shows that in both feet the vinculum is a single structure, which is attached to the branch of the tendon of the flexor profundus supplying digit ɪᴠ., and not to the tendon before its trifurcation.

In the strength of the vinculum *Rhinochetus* is unlike most of the Ardeidæ, in which family there is a tendency for it to disappear. I have found this vinculum absent in a specimen of *Nycticorax griseus*; but in this case the vinculum was functionally replaced by a portion of one of the short flexor muscles, which, as in *Rhea* (*cf.*

[1] A MS. note in the handwriting of Mr. Forbes with a sketch shows that my description of the two vincula in *Scopus* was probably correct. It is important to notice the variation.

Gadow, **16**, plate xxiii. A. fig. 7), arises from the deep flexors; in *Nycticorax* the muscle was attached to the tendons of both flexors. It would be worth while to inquire into the relations between the muscle and the vinculum, since there are cases of the conversion of muscles into ligaments among birds [1], among which I may mention the ligament in the Hornbills representing the glutæus maximus of other birds [2]. In *Ardetta exilis* and *A. involucris* there is no vinculum (Forbes, MS.).

(15) The attachment of the flexor tendons to the phalanges varies slightly in different birds.

In the third toe the tendons of the *flexor perforatus* and the *flexor perforans et perforatus* are joined by a short ligament not far in front of the insertion of the first on to the digit; there is no such connection in the case of the same tendons supplying digit II. Digit IV. has of course, like all other birds, no *flexor perforans et perforatus*.

The branches of the *flexor profundus* run to the last phalanx of each digit to which they are attached; but during their course they also give off branches to other phalanges; in the second toe the tendon is attached not only to the last but to the penultimate phalanx. The same additional insertion is present in digits III. and IV., but the IVth digit has a third attachment close to where the tendon perforates the tendon of the *flexor perforatus*; in digits III. and IV. there are several thin branches placed just behind the final insertion of the main tendon.

Affinities of Rhinochetus.

The original describers of this bird, MM. Des Murs and Verreaux [**1**], placed it definitely with the Ardeidæ; their opinion was based upon the general coloration: the powder-down patches which characterize this bird, and are to a certain extent evidence of its affinity with the Ardeidæ, were not mentioned; the presence of these was first noticed by Mr. Bartlett.

The arrival of a specimen at the Society's Gardens in 1862 enabled Mr. Bartlett to study the habits of *Rhinochetus* [**3**]; he mentions that its movements are lively and quick, and not slow like those of a Heron; its mode of feeding and its food (snails, earthworms) differ from those of the Herons; it is compared with *Eurypyga* and regarded as Ardeine.

In 1866 Mr. Bartlett described the egg, which is blotched like that of *Eurypyga* and the Cranes, and quite unlike the Heron's pale green egg with no markings; again, the lively movements are those of a Crane rather than of a Heron.

Prof. Parker, in his 'Monograph upon the Shoulder-girdle,' united

[1] This matter has been gone into by Mr. J. Bland Sutton, F.R.C.S., in his interesting work 'Ligaments, their Nature and Morphology.'

[2] Dr. Gadow, in his work on Birds (Bronn's 'Thierreichs'), has mentioned this ligament in *Bucorvus*. It exists in other Hornbills.

Rhinochetus with *Eurypyga* and *Psophia* as a subfamily (*Psophiinæ*) of the Cranes. In his paper on the Osteology of the Kagu [7] more stress was laid upon the Ardeine affinities as exhibited in the skull. Prof. Parker's views are summed up in the concluding paragraph, which is as follows:—

"In summing up the affinities of the Kagu, I may say that my view of it is that it is a *generalized* Crane, that it is nearer of kin to *Eurypyga* than to *Psophia*, the latter coming near to the Balearic Crane, whilst *Eurypyga*, like the Kagu, makes a very near approach to the Night Herons amongst the typical Ardeinæ. The Kagu is related to the Rails; but so, indeed, are all the Gruinæ; and Professor Huxley has, with great sagacity, put both these families into one group, and has called the group the Geranomorphæ."

Garrod [19] discovered that *Rhinochetus* possessed, of the leg-muscles used by him in classification, the ambiens, femorocaudal, semitendinosus, and accessory semitendinosus; its formula therefore is written AXY+. In his scheme of classification *Rhinochetus* is not mentioned, but it may be inferred that it would have been placed among the Charadriiformes, a group which includes the Cranes, Gulls, and Limicolæ.

Mr. W. A. Forbes [22] associated together *Rhinochetus*, *Mesites*, and *Eurypyga* into a single family of his group Pluviales, which corresponds to the non-columbine Charadriiformes of Garrod.

Dr. Gadow [16], from a study of the intestinal convolutions, was led to believe that *Rhinochetus* should be placed in the near neighbourhood of *Eurypyga* and *Heliornis*; it shows "Ralline, Limicoline, and Ibis-like features"; but he finds no affinities with the Herodiones.

Dr. Murie's important paper [8] is illustrated by two plates, in which many of the details of the anatomy of the bird are well shown; it is compared with *Eurypyga* on the one hand and with *Cancroma* on the other; the descriptions show that the affinities are closer to the former than to the latter genus.

Prof. Newton [17] is inclined to compare *Rhinochetus* with the Limicolæ, but to doubt the nearness of its connection with *Eurypyga*; he suggests a suborder "*Grues*," which might consist of the families Eurypygidæ, Rhinochetidæ, Gruidæ, Psophiidæ, and Aramidæ.

Dr. Fürbringer's [15] opinions are presented in a graphic form in the elaborate pedigree diagrams which accompany his work on the classification of birds. He does not accept, any more than does Prof. Newton, Mr. Sclater's group Alectorides [18]. His *Gruiformes*, however, which equals Prof. Newton's *Grues* with the addition of the Cariamidæ, only differs from Mr. Sclater's *Alectorides* in not including the Otididæ. Among the Gruiformes, *Eurypyga* is the type which comes nearest to *Rhinochetus*, but is nevertheless sufficiently different to be placed in a distinct family. Affinities with the Herodii are admitted.

The facts recorded in the present paper do not lend much support to the Ardeine affinities of *Rhinochetus*, though the presence of powder-downs and certain points in the structure of the skull seem to me, as they have seemed to Fürbringer, to indicate a certain degree of relationship in this direction. The muscular anatomy as a whole is decidedly Crane-like, as will be seen by the following table, which shows some of the resemblances and differences between the Cranes, Herons, and *Rhinochetus*.

	Grus.	*Rhinochetus*.	*Ardeidæ*.
Ambiens.	+	+	0
Access. fem.-caud.	+	0	0
Peroneus brevis ..	+	+	0
Biceps slip	+	0[1]	0
Vinculum between flex. hall. and flex. prof.	Strong, attached before trifurcation of flex. prof.	Strong, attached before trifurcation of flex. prof.	Weak or absent.
Semitendinosus ...	Inserted in common with tendon of semimembranosus.	Inserted in common with tendon of semimembranosus.	No insertion on to femur.
Tensor patagii brevis.	A tendinous slip running from insertion diagonally across patagium.	No such tendinous slip.	Tendinous slip present.
Expansor secundariorum.........	+	+	Absent in some.

At the same time the absence (?) of a biceps slip to the patagium and the presence of a peculiar additional biceps muscle are peculiarities which mark off *Rhinochetus* from other Crane-like birds.

The syrinx is not specially like that of the Herons; it is perhaps more like that of *Cariama* than other types, but is also like many other Gralline birds. With regard to the special affinities between *Rhinochetus* and *Eurypyga* they are evidently very close; but I propose to defer the consideration of these until I have an opportunity of adding to my notes upon *Eurypyga*.

[1] I could not find the biceps slip in my specimen, but as I have since found a MS. note by Garrod affirming its presence, I have possibly failed to see it.

4. On a Collection of Land-Shells made in Borneo by Mr. A. Everett, with Descriptions of supposed new Species. By Lieut.-Col. H. H. Godwin-Austen, F.R.S., F.Z.S., &c.—Part II.[1] Zonitidæ and Helicidæ.

[Received January 1, 1891.]

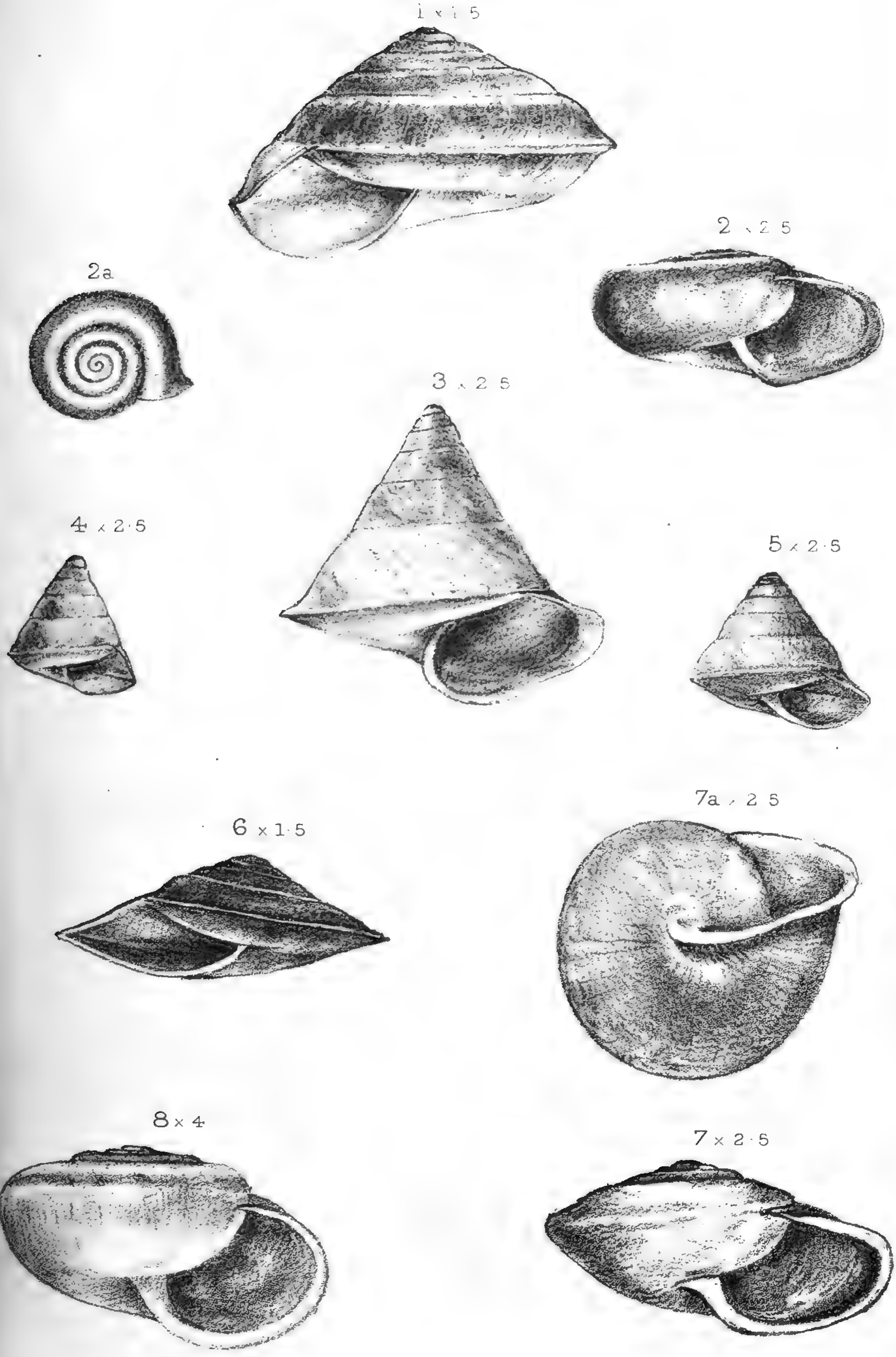
(Plates II.–VI.)

It is necessary to limit this second part of my memoir on the Bornean land-shells to those contained in the two families Zonitidæ and Helicidæ, not including the genera *Bulimus*, *Achatina*, &c., for I have not had leisure to examine the species of *Stenogyra* in the collection. Since submitting the first part I have received, through the kindness of Mr. J. Whitehead, all the shells he collected in Borneo and Palawan. I have also had placed in my hands a second consignment from Mr. Everett since his last return to Borneo. Both of these collections contain examples of new species, particularly the last mentioned, for the shells in it had been obtained by Mr. Hose, when collecting orchids in the mountains of the interior of Borneo, in quite new ground. This last collection will also add a considerable supplemental list to my paper on the operculated shells of Borneo already published. I have also to thank Mr. Aldrich of Cincinnati, for sending me examples of the new species which he obtained from Borneo through Mr. Doherty, some of which Mr. Aldrich had already described. A *Diplommatina*, referred by him to *D. concinna*, I find to be a new species, which I have recently described and figured as *D. aldrichi* (see Ann. Mag. N. H. ser. 6, vol. vi. p. 246, pl. vii. fig. 3).

The examination of these shells has brought out several interesting facts connected with the distribution of genera. It has extended the range of some, up to the present exclusively Indian genera, thus far to the eastward. For instance, the genus *Microcystina*, first described from the Nicobar Islands by Mörch, and there and in the neighbouring Andaman Islands represented by three species, has now been found in Borneo, represented by four species. They are small glassy shells, with a peculiar twisted columellar margin, which readily distinguishes them from other similar-looking shells. This genus has not been found either in the Eastern Himalaya or the Khasi Hill-ranges, both of which have been well worked, neither as yet in Pegu or in Upper Burmah. However, in this last-named country vast areas exist which have never been systematically searched, so that species of the genus may very likely be found in the mountainous country between Burmah, Tenasserim, and Siam.

Durgella is another genus that we find ranging thus far to the eastward, represented by small heliciform delicate glassy shells; the anatomy and the odontophore of the Bornean species are precisely similar to those of a species found in the Khasi Hills, and of another

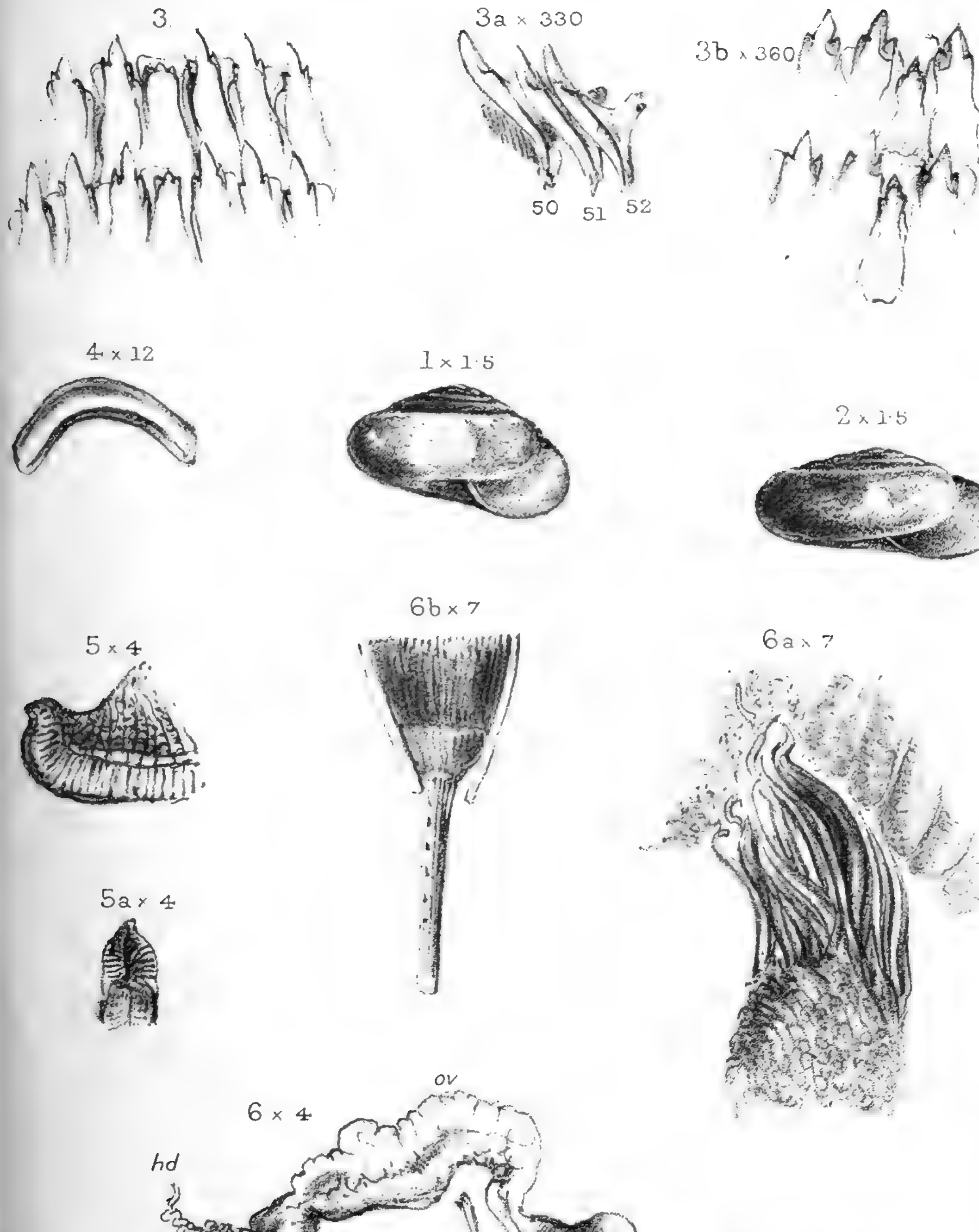
[1] For Part I., see P. Z. S. 1889, p. 332.



NEW BORNEAN LAND-SHELLS.

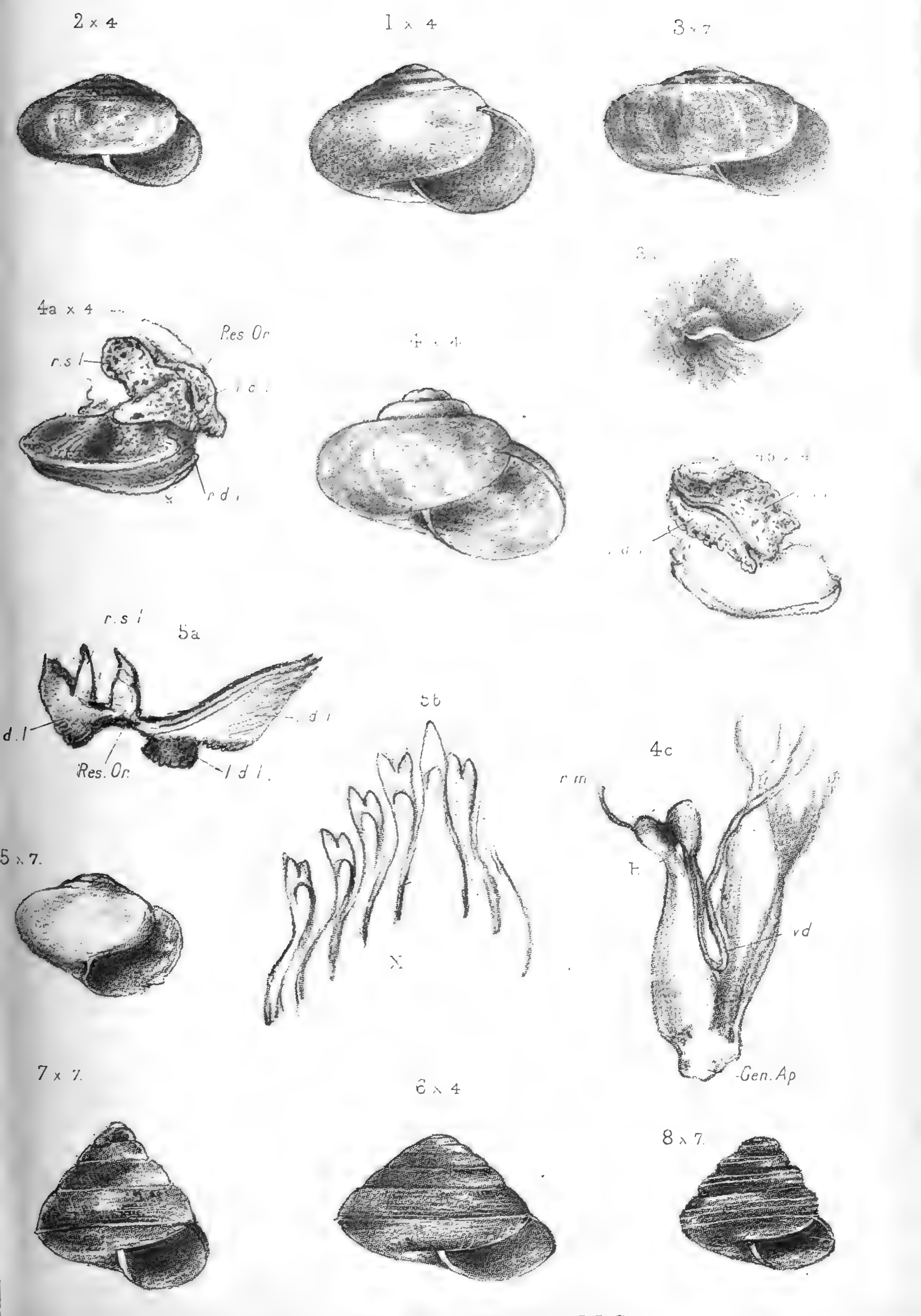
win-Austen, del.

Maclure & C° lith.



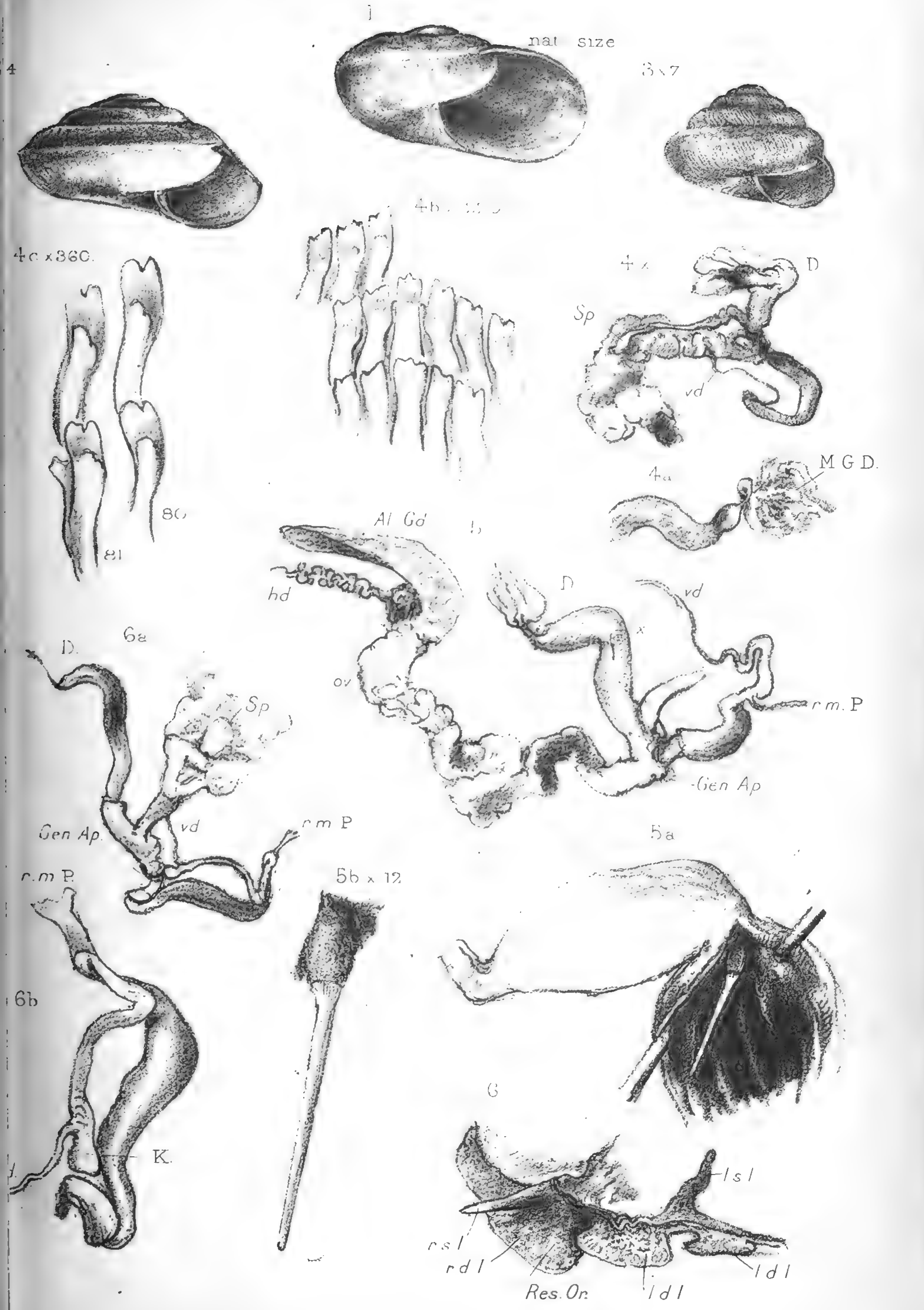
NEW BORNEAN LAND-SHELLS.

Austen, del. Maclure & C°. lith.



NEW BORNEAN LAND-SHELLS.

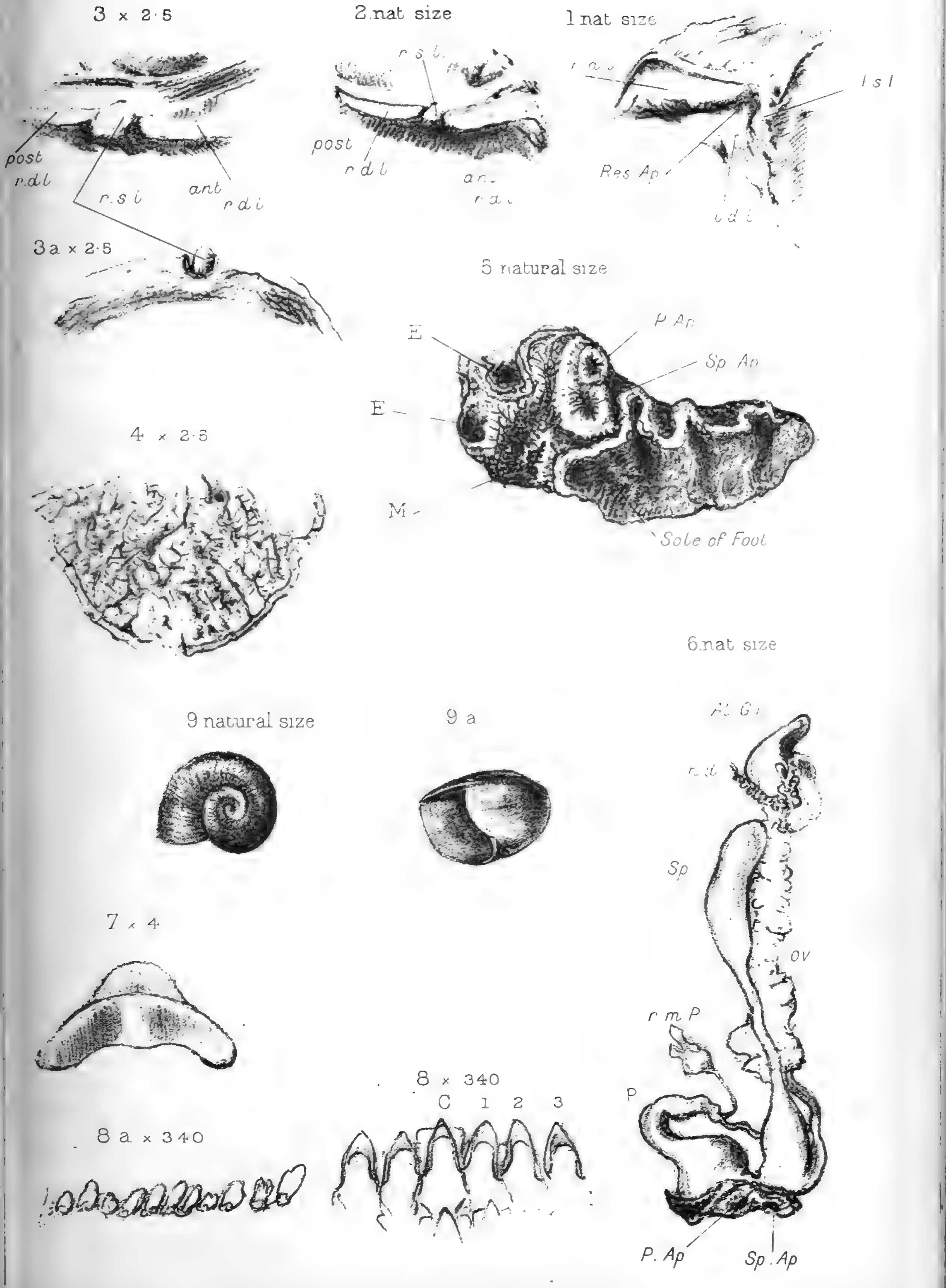
n-Austen del. Maclure & C°. lith.



NEW BORNEAN LAND-SHELLS.

dn-Austen, del

Maclure & C^o lith



NEW BORNEAN LAND-SHELLS

...in-Austen, del.

Maclure & C°. lith.

obtained by Colonel Beddome in Travancore. *Sitala* is another genus having a similar distribution, and one section of it (represented by the peculiar little shells *S. tricarinata* and *S. subbilirata* of the Nilghiri and Andaman Islands respectively) finds a representative species in Borneo in *Sitala kusana*. When the intervening countries and islands come to be better known, other allied forms will no doubt be found.

The closer the external characters of the animal are looked at, and the more an attempt is made to combine these with the form of the shell for the purpose of generic classification, the greater are the difficulties met with. Dr. von Martens found this so much the case when he took up the Land-shells of Eastern Asia, that he fell back on to the shell alone. If, however, we go further and take the internal anatomy, especially the points of difference in the reproductive and other organs, and the odontophore, which has been so well done by Professor Semper in the same region, we do find some well-marked differences, and these we discover have but little bearing on the form of the shell, which may be considered as of secondary importance. It is to be expected that modification of the internal structure of the animal is brought about much more slowly than change in the shelly covering, and that it is consequently far more persistent. The first is a combination of many different organs, a change in one affecting all the others, while the shell is a single structure merely secreted by the mantle, and affected rapidly by change of climatic conditions and the nature of the rock on which the animal lives.

When such a sounder system of classification has been thoroughly worked out, we shall be able to trace with some degree of exactness the areas over which certain genera of Land-Mollusca extend. Then noting how such areas have been affected by the more recent geological changes leading up to the present outlines of the land and the intervening seas, we may be enabled to contemplate and draw some conclusions as to how far present distribution has been dependent on and connected with such changes.

In the descriptions of the species which follow, I have attempted to show how very different are details of the anatomy of the Bornean Helices when compared with those of very similar-looking shells of the Indian region.

Fam. ZONITIDÆ.

Vaginula hasselti, v. Martens, Preuss. Exped. Ost-Asien, Landschneck. p. 176, t. v. figs. 2, 4 (1867); Fisch. Nouv. Arch. du Mus. vii. p. 158 (1871).

Hab. Borneo, near Benkajang.

Vaginula bleekeri, Keferst. Zeitschr. f. wiss. Zool. 1865, p. 118, t. ix. figs. 1, 2; v. Martens, Preuss. Exped. Ost-Asien, Landschneck. p. 177 (1867); Fisch. Nouv. Arch. du Mus. vii. p. 161 (1871).

Hab. Sarawak (*Doria* and *Beccari*).

Vaginula wallacei, Issel, Ann. Mus. Civ. Genova, vi. p. 385, t. iv. figs. 1–3 (1874).

Hab. Sarawak, one example (*Doria* and *Beccari*).

Parmarion beccarii, Issel, Ann. Mus. Civ. Genova, vi. p. 386, t. iv. figs. 9–11 (1874).

Hab. Sarawak, two examples (*Doria* and *Beccari*).

Parmarion doriæ, Issel, Ann. Mus. Civ. Genova, vi. p. 388, t. iv. figs. 7, 8 (1874).

Hab. Sarawak, one example (*Doria* and *Beccari*).

Damayantia dilecta, Issel, Ann. Mus. Civ. Genova, vi. p. 390, t. iv. figs. 4–6 (1874).

Hab. Sarawak, three examples (*Doria* and *Beccari*).

Helicarion borneensis.

Vitrina borneensis, Pfeiff. P. Z. S. 1856, p. 324; id. Monogr. Helic. iv. p. 793 (1859); id. Novitat. Conch. t. xxviii. figs. 10–12; Reeve, Conch. Icon. pl. vi. fig. 41.

Helicarion borneensis, v. Martens, Preuss. Exped. Ost-Asien, Landschneck. p. 186 (1867).

Hab. Borneo (*Cuming Coll.*).

This shell has not since been sent home from Borneo, and I am therefore in doubt as to the correctness of habitat assigned to it.

HELICARION (?) WHITEHEADI, n. sp. (Plate V. fig. 1.)

Shell depressedly globose, tumid, slight subangulation on periphery, not perforate; sculpture coarse, a peculiarly wrinkled surface, the lines having a very oblique transverse direction; colour rich umber-brown, pale purple and iridescent within the aperture; spire low, rounded on apex; suture impressed; whorls $3\frac{1}{2}$, rapidly increasing, the last much expanded; aperture widely ovate, oblique; peristome thin, not reflected at all on columellar margin, which is subvertical.

Size: maj. diam. 35·0, min. 28·0; alt. axis 12·0; breadth of aperture 20·0 millim.

Hab. Kina Balu Mountain, altitude not known (*Mr. J. Whitehead*).

I place this next to *Helicarion borneensis*, not that I think it has any affinity to that genus as restricted, but only in its widest sense; the animal would be a most interesting one to examine, and will probably be found allied to local races, and not having anything in common with forms such as *Girasia* of the Indian Region, with which the shell outwardly has resemblance. Only two specimens were brought home by Mr. Whitehead.

XESTA GLUTINOSA. (Plate V. figs. 6–6 *b*.)

Helix glutinosa, Metcalfe, P. Z. S. 1851, p. 70; Pfeiff. Monogr. Helic. iii. p. 54 (1853), et v. p. 90 (1868); Reeve, Conch. Icon. pl. cxcvi. fig. 1378 (1854).

Nanina glutinosa, v. Martens, Preuss. Exped. Ost-Asien, Landschneck. p. 214 (1867).

Macrochlamys glutinosa, Wallace, P. Z. S. 1865, p. 405.

Nanina (*Xesta*) *glutinosa*, Issel, Ann. Mus. Civ. Genova, vi. p. 392 (1874).

Hab. Niah Hills (*A. Everett*).

Mr. Everett collected a fine set of this species, which has a very conspicuous canaliculate groove above the keel of the shell, and this on the upper whorls produces a raised beading at the suture. In the same locality he obtained a beautiful dark madder-brown variety, similar in coloration to *X. decrespignyi*, which retains exactly the form of the typical shell, and is not separable by any other character. I would designate this as var. *rubra*.

Shell-lobes (Plate V. fig. 6, *r.s.l.* and *l.s.l.*) as in *Macrochlamys*; the right dorsal lobe (*r.d.l.*) large; the left differs from above and is divided in two parts, of which the anterior is narrow and long, the posterior being very rudimentary. Situated between, there is a very well-defined long tongue-like shell-lobe. The living shell must be very prettily mottled, as the black-spotted integuments of the respiratory sac would show through the glassy thin shell.

Mucous gland with an overhanging lobe, the aperture does not extend down to the sole of the foot as shown in pl. xxxv. fig. 6 of my 'Land and Freshwater Mollusca of India.'

Odontophore has plain, unicuspid, triangular-shaped centrals; about eighty of the outer laterals are bicuspid, and those on the side of the radula are very minute:

110 . 14 . 1 . 14 . 110
124 . 1 . 124.

Jaw slightly curved on the cutting-edge, with only the slightest indication of a central projection. The generative organs approach nearest to *Macrochlamys* of the Indian Region, but variation presents itself in the male organ (Plate V. figs. 6 *a* and 6 *b*). It is bent upon itself, the kalc-sac is short and knob-like, and where the retractor muscle is given off there is a simple bend, with no projection, and doubling together of the tube and the formation of a coil as in so many of the Indian genera and species. The drawings given by Professor Semper of the reproductive organs of *Xesta*, which include *X. citrina* and *X. mindanaensis*, particularly of the latter, agree with *X. glutinosa*. As regards the odontophore, it is similar to that of *X. citrina* in the simple centrals, which I consider to be the type of the genus; it is also the type of *X. mindanaensis*. It may be noted that the odontophores of the Indian species *X. belangeri*, *tranquebarica*, and *maderaspatana* differ considerably in their tricuspid form, and will, I think, prove different in other characters[1].

[1] In the British Museum (Cuming Collection) is a specimen labelled from the Solomon Islands (Hon. Capt. Keppel) named *H. capitanea*, Pfr. (P. Z. S. 1854, p. 49). It is a young shell, evidently of *X. glutinosa*, and, I should say, not obtained in the islands quoted.

XESTA DECRESPIGNYI.

Nanina (*Xesta*) *decrespignyi*, Higgins, P. Z. S. 1868, p. 179, pl. xiv. fig. 4; Issel, Ann. Mus. Civ. Genova, vi. p. 392, t. v. figs. 13–15 (1874).

Hab. Trusan (*A. Everett*).

The animal has exactly the same form of shell-lobes as in *X. glutinosa* above described.

Nov. var. *pallida fasciata*.

In Dr. Hungerford's collection there is one specimen which in every respect resembles this shell except in coloration, this being of the pale yellowish tint of *X. glutinosa*, and like that shell having a single thin dark band on the periphery, a similar variation to that met with in *X. glutinosa*, only in an opposite direction.

Xesta (?) *brotii*.

Helix brotii, Bonnet, Rev. Zool. 1864, p. 67, pl. v. fig. 1; Pfeiff. Monogr. Helic. v. p. 460 (1868); v. Martens, Preuss. Exped. Ost-Asien, Landschneck. p. 397 (1867).

HEMIPLECTA DENSA.

Helix densa, Adams & Reeve, Zool. Voy. Samarang, Moll. p. 62, pl. xvi. fig. 8 (1850); Pfeiff. Monogr. Helic. iii. p. 111 (1853), et v. p. 180 (1868).

Helix schumacheriana, Pfeiff. Zeitschr. f. Malak. 1850, p. 70; id. Monogr. Helic. iv. p. 110 (1859); Metcalfe, P. Z. S. 1851, p. 70; Reeve, Conch. Icon. pl. lxxiii. fig. 379 (1852).

Nanina corrosa, Mousson, Journ. d. Conch. vi. p. 156 (1857).

Helix corrosa, Pfeiff. Monogr. Helic. iv. p. 348 (1859).

Nanina herklotsiana, Dohrn, Malak. Blätt. vi. p. 206 (1859).

Nanina atrofusca, Albers, Helic. ed. ii. p. 53 (1860).

Hemiplecta schumacheriana, Wall. P. Z. S. 1865, p. 406.

Nanina densa, v. Martens, Preuss. Exped. Ost-Asien, Landschneck. p. 230, t. x. fig. 1 (1867).

Animal:—The extremity of the foot is rather square, the mucous gland large, not extending to the sole of the foot, and with apparently no overhanging lobe. The right dorsal lobe is of usual size, but the left is very poorly developed, being very narrow and separated into two parts, the posterior portion being narrow and only 6 millim. long; in the space between them lies a small left shell-lobe, flat and tongue-shaped; a right shell-lobe is also present, which would appear in life to be broad and triangular in outline.

The odontophore is like that of *H. humphreysiana* from Singapur, the type of the genus *Hemiplecta*. Jaw circular, no central projection. The shells had been taken evidently in the cold season, and the generative organs were not fully developed in the specimens I dissected, but enough was seen to show the presence of a long simple amatorial organ, and the male organ also as in *Hemiplecta*.

Hemiplecta souleyetiana.

Helix souleyetiana, Pfeiff. P. Z. S. 1851, p. 252; id. Monogr. Helic. iii. p. 74 (1853), et v. p. 130 (1868); id. in Martini u. Chemnitz, Conch.-Cab. ed. ii. p. 401, pl. cxliv. figs. 16, 17.

Nanina souleyetiana, v. Martens, Preuss. Exped. Ost-Asien, Landschneck. p. 233 (1867); Issel, Ann. Mus. Civ. Genova, vi. p. 396 (1874).

Issel says this is a doubtful species from Zamboanga.

Hemiplecta donovani.

Helix donovani, Pfeiff. Zeitschr. f. Malak. 1851, p. 26; id. Monogr. Helic. iii. p. 75 (1853), et v. p. 130 (1868); id. in Mart. u. Chemn. Conch.-Cab. ed. ii. p. 413, t. cxlvii. figs. 8, 9.

Nanina donovani, v. Martens, Preuss. Exped. Ost-Asien, Landschneck. p. 233 (1867).

Hemiplecta (?) *obliquata.*

Helix obliquata, Reeve, Conch. Icon. pl. lxxiv. fig. 384 (1852); Pfeiff. Monogr. Helic. v. p. 115 (1868).

Nanina obliquata, v. Martens, Preuss. Exped. Ost-Asien, Landschneck. p. 235 (1867).

Xesta obliquata, Semper, Reisen im Arch. Philippinen, Landmoll. p. 67 (1870).

Hab. Banghey Island (*A. Everett*).

Hemiplecta (?) *nobilis.*

Helix nobilis, Pfeiff. (non Reeve), P. Z. S. 1849, p. 126; id. Monogr. Helic. iii. p. 69 (1853), et v. p. 121 (1868); id. in Mart. u. Chemn. Conch.-Cab. ed. ii. p. 291, pl. cxxv. figs. 1, 2.

Xesta nobilis, Semper, Reisen im Arch. Philippinen, Landmoll. p. 67 (1870).

Ryssota brookei. (Plate VI.)

Helix brookei, Adams & Reeve, Zool. Voy. Samarang, Moll. p. 60, pl. xv. figs. 4 *a*, 4 *b* (1850); Metcalfe, P. Z. S. 1851, p. 70; Reeve, Conch. Icon. pl. lxxiii. fig. 377 (1852); Pfeiff. Monogr. Helic. iii. p. 52 (1853), et v. p. 81 (1868); Mart. u. Chemn. Conch.-Cab. ed. ii. p. 350, pl. cxxxv. figs. 1, 2.

Helix gigas, Pfeiff. Zeitschr. f. Malak. 1850, p. 81.

Ryssota brookei, Wall. P. Z. S. 1865, p. 407.

Nanina brookei, v. Martens, Preuss. Exped. Ost-Asien, Landschneck. p. 238 (1867).

Nanina (*Rhyssota*) *brookei,* Issel, Ann. Mus. Civ. Genova, vi. p. 397 (1874).

Ariophanta brookei, Pfeiff. u. Cless. Nomencl. Helic. p. 55 (1881).

Size: maj. diam. 80·0, min. 67·0; alt. axis 39·0 millim.

The young shell, several of which occurred in the collection sent to the British Museum by Mr. Hose, and which, owing to the kindness of Mr. Edgar Smith, I am enabled to figure (Plate VI. figs. 9, 9 *a*), consists of two whorls, is globose, very thin and delicate, transparent, of a ruddy brown colour, with an elongate quadrate aperture flatly convex above, and measures, maj. diam. 18·0, alt. axis 10·5 millim. It would be interesting to know at what age it reaches this size and its full maturity.

Description of the animal from a spirit-specimen:—Foot below not divided as in *Macrochlamys*, &c.; no mucous gland; the extremity of the foot is flattened, rounded (Plate VI. fig. 4); the pallial margin very narrow and with no pallial groove (fig. 5) as seen in the genus *Ariophanta*, &c. In life I should say the animal was very similar to that of *H. ochthoplax*, Bs.

There is not the slightest trace in the spirit-specimen of a mucous gland either above or below, and although von Martens in his work, 'Die Preuss. Exped. Ost-Asien, Landschneck.,' says at p. 188 that in some large coarse species, as *Rhysota ovum* and *Xesta distincta*, he found the foot coarsely wrinkled, flat, and with a blunt end, the slime-gland little marked, so that on the whole it resembles the foot of *Helix pomatia*, yet I feel sure there would remain some indication of the gland in the spirit-specimen; surely the divided sole of the foot would remain visible, and some modification of the pallial margin would show where the slit of the gland was situated, but in this large Bornean species there is no trace left to show that it ever existed.

The dorsal lobes of the mantle (Plate VI. figs. 1, 2, 3, 3 *a*) are small for the size of the animal. The left dorsal lobe (we are speaking of a sinistral species) is of the ordinary form; the right is divided into two separate parts, one anterior, the other posterior. Exactly between these two is a right or peristomial shell-lobe (see figs. 2, 3), and near the respiratory orifice at the inner and upper margin of the aperture a tongue-like left shell-lobe is given off from the margin of the left dorsal lobe. This, although much contracted by the spirit, is evidently of considerable extension when alive. (In Semper's description of *Ryssota* both shell-lobes are said to be absent.) So that here we have in this sinistral species an approach to *Macrochlamys* in its shell-lobes, and to the genus *Oxytes* in its dorsal lobes. The contraction of the animal shows the apertures coinciding with the male organ and the spermatheca very plainly (see Plate VI. fig. 5).

The generative organs (fig. 6, nat. size) are exactly similar to those of *Ryssota ovum* figured by Semper in 'Reisen im Archipel der Philippinen,' pl. iv. fig. 1, and correspond also with those given on the same plate of *R. porphyria*, *R. semiglobosa*, *R. dvitija*, and *R. bulla*, simple, and having no amatorial organ.

Now, in the five figures given by him of the generative organs of so-called *Ariophanta* on pl. iii., they all possess the amatorial organ with mucous glands and well-developed *sagittæ amatoriæ* (see fig. 18); thus they are of a much more complicated nature than in the species under review.

In *R. brookei* the male organ consists of a large pear-shaped sac, closing towards the posterior end and contracted for a short distance into a tube, the retractor muscle being at the junction of the vas deferens. The spermatheca is very and unusually long, extending to the albumen-gland; it rises from another pear-shaped muscular sac, on the side of which the oviduct enters. There is nothing remarkable about the ovo-testes or albumen-gland.

The odontophore (Plate VI. fig. 8).—The form of the median teeth very gradually merges into that of the laterals, which become at last little short straight teeth. The central teeth are all unicuspid, the central tooth of all being triangular in form; the formula is

$$\begin{array}{c} 109 \;.\; 43 \;.\; 1 \;.\; 43 \;.\; 109 \\ 152 \;.\; 1 \;.\; 152. \end{array}$$

The lingual ribbon I extracted is nearly perfect, not a row was lost, and it contains 177 rows, giving the enormous number of 54,000 teeth.

The jaw (Plate VI. fig. 7) has a low central projection, and is not much bent.

The character of this animal differs so widely from those in genera with which it is now associated that it does not seem at all in the position it should occupy, and with *R. ovum* and others will have to be moved. As I have only been able to obtain one example of *R. brookei* in spirit, it is better to wait until others are examined before doing so.

Nanina (Ryssota) borneensis.

Helix borneensis, Pfeiff. P. Z. S. 1849, p. 127; id. Monogr. Helic. iii. p. 70 (1853), et. v. p. 114 (1868); Reeve, Conch. Icon. pl. cxcvi. fig. 1379 (1854).

Nanina borneensis, v. Martens, Preuss. Exped. Ost-Asien, Landschneck. p. 238.

DYAKIA, gen. nov. (Type, *Helix hugonis*, Pfeiff.)

No shell-lobes to the mantle, and the dorsal lobe much reduced in size. Shells generally sinistral. Hitherto placed in *Ariophanta*. The amatorial organ of peculiar form, with a calcareous dart or *sagitta amatoria*. For further description of details see *D. hugonis*.

DYAKIA HUGONIS. (Plate V. figs. 5–5 *b*.)

Helix hugonis, Pfeiff. P. Z. S. 1863, p. 523; id. Novitat. Conch. iii. pl. lxxiv. figs. 1, 3; id. Monogr. Helic. v. p. 81 (1868).

Helix sinistra, Bonnet, Rev. Zool. 1864, p. 67, pl. v. fig. 2.

Nanina (Hemiplecta) hugonis, v. Martens, Preuss. Exped. Ost-Asien, Landschneck. p. 225 (1868).

The anatomy of *Hemiplecta humphreysiana*, Lea, from Singapore, the type of the genus, which I have examined and alluded to before, differs widely from that of *H. hugonis*.

Hab. Two specimens from Trusan, and one dextral variety from the Niah Hills (*A. Everett*).

Fortunately a few specimens were preserved in spirit by Mr. Everett, and I am thus able to give the following detailed description:—

Animal, pale ruddy colour with small black specklings. The dorsal lobes are very considerably reduced in size; they present a very small lappet-like left dorsal and a fringing right dorsal lobe, and no shell-lobes in the spirit-specimen.

The odontophore consists of numerous teeth in the rows; the laterals very minute and unicuspid; the centrals are simple, straight-sided, spear-shaped teeth without cusps:

$$50 \ . \ 60 \ . \ 18 \ . \ 1 \ . \ 18 \ . \ 50 \text{ or } 60$$
$$78 \ . \ 1 \ . \ 78.$$

The jaw is arched with a central projection.

The generative organs (Plate V. fig. 5) are interesting because they are, as regards the amatory organ, like some other forms from the same region, and present a type not yet known to exist in India.

The male organ is simple, bent on itself; the amatorial organ has at the free end a large secretory gland, made up of five separate glands; a short muscular cylindrical part comes next, armed at the lower part with a very beautiful fine calcareous dart 3·25 millim. in length (figs. 5 *a* and 5 *b*); its position is at the end of a long cylindrical open sac with rugous sides, near the base of which is the spermatheca. The albumen-gland is large, but the other parts of the generative organs present nothing that differs from the usual form.

Several of the sinistral shells inhabiting the Malay Archipelago were placed in the genus *Ariophanta* by Prof. Semper; but as I have pointed out in 'Land and Freshwater Moll. of India,' p. 133, they are very unlike the type of this genus, which is from Bombay, and require a subgeneric position assigned to them. The principal and remarkable character is the form of the amatorial organ, so well illustrated by Professor Semper on pl. iii. of his fine work on the Land-Mollusca of the Philippine Archipelago, where he figures the generative organs of *Ariophanta rareguttata* (Adenore), *rumphii* (Java), *nemorensis* (Celebes), and *striata* (Singapore). On pl. vii. of the same work the form of the teeth of the radula of five species is given; here dissimilarity exists. *A.* (*Amphidroma*) *martini* (Sumatra), *rareguttata*, and *nemorensis* have plain simple teeth; but in *A. rumphii* and *striata* they are tricuspid, merging into bicuspid shape in the laterals. All these species should now be placed in the genus *Dyakia.*

DYAKIA INTRADENTATA, n. sp.

Shell very similar to *D. hugonis* in form and coloration, more acute in the spire and rather flatter on the base, with the umbilical region more excavated. The whorls more closely wound. Sculpture coarser and more decussate, that on the lower side finely papillate. Looked at from below there is a very remarkable dent or small depression indicating the presence of an internal tooth, and this is situated at the distance of exactly half a whorl from the aperture.

Molu Mountains, in Dr. Hungerford's collection (*Boxall*).

Having seen but one specimen, I at first thought that this shell was only a reversed variety of *D. hugonis*, and that the depression was the result of some injury. I now find that Dr. Hungerford has two specimens, and a young shell in Mr. Everett's collection from the Niah Hills is evidently of the same species.

DYAKIA REGALIS.

Helix regalis, Benson, Ann. Mag. N. H. ser. 2, vol. v. p. 215 (1850); Reeve, Conch. Icon. pl. xcvi. fig. 526 (1852); Pfeiff. Monogr. Helic. iii. p. 52 (1853), et v. p. 82 (1868); id. in Mart. u. Chemn. Conch.-Cab. ed. ii. p. 377, t. cxli. figs. 5, 6.

Helix vittata, Adams & Reeve, Zool. Voy. Samarang, Moll. p. 60, pl. xv. figs. 7 *a–c* (1850); Metcalfe, P. Z. S. 1851, p. 70.

Ryssota (?) *regalis*, Wall. P. Z. S. 1865, p. 407.

Nanina regalis, v. Martens, Preuss. Exped. Ost-Asien, Landschneck. p. 225 (1867).

Var. UNICOLOR.

N.W. Borneo (*Everett*).

DYAKIA BUSANENSIS, n. sp. (Plate II. fig. 1.)

Shell discoid, sharply keeled; umbilicated; sculpture above finely decussate, produced by rather irregular transverse lines of growth crossed by very longitudinal hair-like striæ; below glassy, no spiral striæ, a few transverse lines; colour pale ashy white, with a single broad band next to the periphery and suture; spire low, flatly pyramidal; apex rounded; suture a mere thread; whorls 5, sides very flat; aperture semilunate, oblique; peristome thin; columellar margin oblique, not reflected, very weak.

Size: maj. diam. 19·0, min. 17·2; alt. axis 6·7 millim.

Hab. Busan Hills (*A. Everett*).

Dyakia janus.

Helix janus bifrons, Chemn. Conch.-Cab. xi. p. 307, t. 213. figs. 3016, 3017.

Helix janus, Pfeiff. Monogr. Helic. i. p. 77 (1848), et v. p. 83 (1868); Reeve, Conch. Icon. pl. xci. fig. 494 (1852).

Nanina albersi, v. Martens, Monatsber. Akad. Berlin, 1864, p. 265; id. Preuss. Exped. Ost-Asien, Landschneck. p. 224, et xi. fig. 3 (1867).

Ryssota (?) *janus*, Wall. P. Z. S. 1865, p. 407.

Nanina janus, v. Martens, Preuss. Exped. Ost-Asien, Landschneck. p. 226, t. xi. fig. 4 (1867).

Dyakia amphidroma.

Helix janus bifrons, var., Rousseau in Hombr. et Jacq. Voy. au Pôle Sud, Zool. v. p. 11, pl. v. figs. 1–3 (1854).

Helix martini, Pfeiff. P. Z. S. 1854, p. 149; id. Monogr. Helic. v. p. 300 (1859); Reeve, Conch. Icon. pl. cxciii. fig. 1356 (1854).

Nanina amphidroma, v. Martens, Monatsber. Akad. Berl. 1864,

p. 265 ; id. Preuss. Exped. Ost-Asien, Landschneck. p. 221, t. xi. figs. 2, 5, t. vi. figs. 3, 3 *b* (1867).

Nanina producta, Mousson, in collect.

Ariophanta martini, Pfr., Sumatra (=*amphidroma*, v. Mart.), Semper, Reise im Arch. d. Philipp., Landmoll. p. 51, t. vii. fig. 4.

Dyakia (?) *striata*.

Nanina striata, Gray, P. Z. S. 1834, p. 59 ; v. Martens, Preuss. Exped. Ost-Asien, Landschneck. p. 228 (1867).

Helix orientalis, Reeve (non Gray), Conch. Icon. pl. lxxviii. fig. 409 (1852).

Helix naninoides (Benson), Pfeiff. Monogr. Helic. v. p. 122 (1868).

Helix striata, Pfeiff. Monogr. Helic. i. p. 55 (1848).

Helix isabella, Rousseau in Hombr. et Jacq. Voy. au Pôle Sud, Zool. v. p. 6, t. iv. figs. 7–10 (1854).

Hemiplecta naninoides, Wall. P. Z. S. 1865, p. 406.

Ariophanta striata, Semper, Reisen im Arch. d. Philipp., Landmoll. p. 53, t. iii. figs. 21 *a*, *b*, t. vii. fig. 5.

Dyakia (?) *mindaiensis*.

Helix mindaiensis, Bock, P. Z. S. 1881, p. 633 (Amonta District).

Dyakia (?) *sarawakana* : *Nanina* (*Ariophanta*) *sarawakana*, Dohrn, Nachricht. deutsch. Malak. Gesellsch. 1881, p. 66 (Sarawak).

DYAKIA NASUTA. (Plate V. figs. 4–4 *c*.)

Helix nasuta, Metcalfe, P. Z. S. 1851, p. 70 ; Pfeiff. Monogr. Helic. iii. p. 203 (1853), et v. p. 306 (1868) ; Reeve, Conch. Icon. pl. clvii. fig. 1031 (1853).

Ryssota ? *nasuta*, Wall. P. Z. S. 1865, p. 407.

Nanina (*Hemiplecta*) *nasuta*, v. Martens, Preuss. Exped. Ost-Asien, Landschneck. p. 224 (1867).

Hab. Niah Hills.

One specimen of this very remarkable and beautiful shell was preserved in spirit. Animal pale-coloured, like that of *D. hugonis* ; the mucous gland has a very small overhanging lobe and a broad pallial margin. The odontophore (Plate V. fig. 4 *b*) has the central tooth tricuspid, the central cusp hardly rising above those on either side ; the median are square at the end, bicuspid, the laterals (fig. 4 *c*, 80th and 81st) have a sharp inner cusp and a rounded outer cusp, rising close together ; the outermost laterals are unicuspid and small :

$$+ 70 . 14 . 1 . 14 . 70 +$$
$$+ 80 . 1 . 80 +.$$

Some of the small outermost teeth were lost in dissection. The generative organs (figs. 4 and 4 *a*) are similar to those of *D. hugonis* and do not require any further description.

It would be difficult to select two shells differing so much in form as *D. hugonis* and *D. nasuta*; any classification based on shell-characters would place them widely apart, yet the animals as regards their structure are closely allied. This points to a long occupation of this island by this group of land-shells.

Dyakia moluensis, n. sp. (Plate II. fig. 6.)

Shell sinistral, depressedly pyramidal, not perforate, solid, rounded below, sharply keeled; sculpture, irregular furrowing, crossed by rough transverse curvilinear and broken granulation; colour dark chestnut-brown, with a lemon-yellow narrow line on the periphery and also running with the suture, a circle of same colour around the umbilicus; spire low, sides flat; apex blunt; suture linear; whorls 5, gradually increasing, flat-sided; aperture semi-lunate, very oblique; peristome thickened below, with a slightly sinuate margin above; columellar margin oblique.

Size: maj. diam. 28·0, min. 24·8; alt. axis 9·3 millim.

Hab. Molu Hills (*A. Everett*).

Only one specimen was sent home of this very pretty shell, which is somewhat like the dextral *H. albula* from Moti Island, one of the Ternate group.

Everettia, subgen. nov. (Plate III.)

(Type, *Macrochlamys jucunda.*)

The animal from a spirit-specimen is pale ochre in colour, with jet-black tentacles and a black band on either side of the neck from the base of the tentacles running backwards.

The pallial margin (fig. 5) is broad, the foot below with a central ambulatory area. The mucous gland (fig. 5 *a*) is large, and in life the extremity of the foot is apparently much pointed and overhanging. There are no linguiform shell-lobes either on the right or left side, but on the latter the lobe is a simple band turned back over the edge of the peristome; both the right and left neck-lobes are very small.

The generative organs (fig. 6) are very peculiar and unlike those of any species I have examined or that I find figured by Professor Semper. The principal difference lies in the amatorial organ or dart-sac; this is cylindrical below as in other genera, but at the inner extremity terminates in a fringe of very numerous accessory glands (fig. 6 *a*), very nearly equal in length to the solid fleshy lower portion. These fringe-like glands are finely pointed and lie buried in a mass of mucous glands having a segmented structure, each separate lobe being associated with one of the accessory glands. The lower end is armed with a stout and solid calcareous dart (Liebespiel), having a conical attachment to the muscular portion (fig. 6 *b*). The penis has no kalc-sac. The albumen-gland is very large.

The odontophore:—The rows of teeth, about 90, gradually decrease to the outer margin, the formula being

30. 26. 1. 26. 30.
56. 1. 56.

The central tooth is much shorter and smaller than the laterals, and is tricuspid (fig. 3 *b*), the two outer cusps being just below the centre point; in one specimen dissected, owing to the central part being much worn, this central tooth is evenly tricuspid (fig. 3). The laterals rise from long narrow plates, and are very pointed, with an outer and inner cusp some distance below the apex, being thus also tricuspid; the outermost laterals are very nearly unicuspid (fig. 3 *a*). The jaw is curved, but has no central projection (fig. 4).

This shell was placed by von Martens in the genus *Macrochlamys*; and looking at its shiny glassy shell, so very like many in the Indian region, I should certainly have done the same; yet the animal differs from that genus not in one but in several characters—externally in the absence of the long shell-lobes; internally in the odontophore and jaw; and in the reproductive organs it is widely separable, *Macrochlamys* not possessing the *spicula amoris*. In searching through Semper's work for characters approaching those now figured and described, I observe the nearest, as might be expected, in those genera found in the islands of the Malay Archipelago and not in those found to the westward in India. On plate iii. figs. 1, 2, Reise im Archipel d. Philipp., is shown the *sagitta amatoria* of *Tennentia philippinensis* and *Parmarion pupillaris*, from Java, of the same type. This I would submit is an indication that the slug-like forms of this part of the world are the descendants of these glassy Helices, just as we find the general anatomy of *Girasia*, a slug-like species of India, to be like that of *Macrochlamys*, and that although the outward form of both animal and shell is very similar respectively, the races of the two areas have a most remote relationship. How far these characters of *Everettia* and *Dyakia* extend around this area is yet to be discovered. We cannot as yet say with certainty that shells with similar internal structure do not exist in India; they are certainly absent in the N.E. Himalayas and Khasi Hill Ranges, but there are numbers of even large species in Southern India yet to be examined, and of which we know as yet nothing. Of the shells of New Guinea we are also quite ignorant, at least I have not seen any work on their anatomical variations.

EVERETTIA CONSUL.

Helix resplendens (Philippi), Metcalfe, P. Z. S. 1851, p. 70 (?).

Helix consul, Pfeiff. P. Z. S. 1854, p. 289; id. Monogr. Helic. iv. p. 44 (1859), et v. p. 97 (1868); id. Novitat. Conch. iii. pl. lxxiv. figs. 13, 14; Reeve, Conch. Icon. pl. cxcviii. fig. 1395 (1854).

Macrochlamys consul, Wall. P. Z. S. 1865, p. 405.

Nanina consul, v. Martens, Preuss. Exp. Ost-Asien, Landschneck. p. 240 (1867).

EVERETTIA JUCUNDA. (Plate III. fig. 1.)

Helix jucunda, Pfeiff. P. Z. S. 1863, p. 524; id. Novitat. Conch. iii. pl. lxxiv. figs. 11, 12; id. Monogr. Helic. v. p. 101 (1868).

Nanina (Macrochlamys) jucunda, v. Martens, Preuss. Exped. Ost-Asien, Landschneck. p. 40, t. xii. fig. 7 (1867).

The specimen figured measures: maj. diam. 19·0, min. 18·5; alt. axis 9·0 millim.

Var. *nana* from Dr. Hungerford's collection. This is a MS. name of Mr. Geoffrey Nevill's, and appears in his copy of the 'Hand-list' as given to two specimens sent to the Indian Museum, Calcutta, as a variety of *jucunda*. The exact locality is not quoted.

Everettia hyalina.

Nanina hyalina, v. Martens, Monatsber. Akad. Berlin, 1864, p. 266; id. Preuss. Exped. Ost-Asien, Landschneck. p. 241, t. xii. fig. 5 (1867).

Helix (Macrochlamys) hyalina, Pfeiff. Monogr. Helic. v. p. 99 (1868).

Size: maj. diam. 22·5, min. 20·25; alt. axis 10·75 millim.

Von Martens describes the animal as black-grey, of a slender form; tentacles and neck black, with a white central line on the latter; mantle reflected; jaw with a middle projection. In many species of *Macrochlamys* similar dark and white varieties occur. This species occurred in a disused gold-mine at Kapuas-Strom, in Upper Pontianak, West Borneo.

Everettia aglaia.

Helix aglaia, Pfeiff. P.Z.S. 1854, p. 289; id. Monogr. Helic. iv. p. 46 (1859), et v. p. 103 (1868); Reeve, Conch. Icon. pl. cxcix. fig. 1396 (1854).

Nanina (Macrochlamys) aglaia, v. Martens, Preuss. Exped. Ost-Asien, Landschneck. p. 242, t. xii. fig. 13 (1867).

Macrochlamys aglaja, var. *emarginata*, Nevill.

Two specimens, Borneo (*Sowerby*, ex coll. Lombe Taylor). In this species the suture is not "*linea rufescente marginata*," Nevill, MS., Hand-l. Ind. Mus.

There is a fine series of these shells in the collection, some 85 specimens, and I have examined those in the British Museum. On my arranging them by localities in juxtaposition, it was at once apparent that those from the Niah Hills, 15 in number, and 2 from Kina Balu were alike and separable from all the rest. These last are *Everettia subconsul* of Mr. Edgar Smith, Ann. Mag. Nat. Hist., Aug. 1887, p. 132, from North Borneo (*J. Whitehead*), with which I have compared them. They may be known by the less number of whorls, *i. e.* not being so closely wound, and those from the Niah Hills are very ruddy in colour and flatter on spire (var. *depressa*, Plate III. fig. 2).

The remainder are from the following localities:—

No. 1. Trusan, 12.

No. 2. Labuan, 82; all range from 15 mm. in maj. diam.

No. 3. Tiga Island, 1; same as No. 2.

No. 4. Dahat Island, 2; olivaceous brown.

No. 5. Karemon Island, 11; these differ from all others in their dark sienna-brown colour, and might be designated as *consul* var. *rufa*.

No. 6. From Dr. Hungerford, marked Borneo; 4 specimens, exactly similar to No. 1, and identified by him as *jucunda*.

No. 7. Marked Borneo, 4; small; maj. diam. 14 mm.; named var. *nana*.

No. 8. Borneo? (*Boxall*), 3; not so closely wound as any from No. 1 to No. 8, but smaller than any of *subconsul*, and, I think, only a dwarf variety of that form.

The largest shell of the whole series was in the set No. 5, and measured 25 mm. maj. diam., alt. axis 14·25, of 7 whorls.

Helix consul was the first to be described from this part of the world, the exact locality being Sarawak; and an examination of the British Museum species led me to the conclusion that *jucunda* and *aglaia* are only based on the size, or at the best may be considered local varieties of *consul*. *E. hyalina* of von Martens appears to be another variety; but the type I have not seen, and it is most difficult to form any opinion from drawings when the differences are so minute and when shades of colour are so subtle and yet so constant in the groups from different areas.

E. hyalina appears to be larger and flatter in the spire than *jucunda*, and the proportions of the before-mentioned varieties come out as follows, as regards the maj. diam.: *E. consul* 22 mm., *jucunda* 11·18, *hyalina* 21·0, and *aglaia* 10·0.

EVERETTIA CUTTERI.

Macrochlamys cutteri, H. Adams, P. Z. S. 1870, p. 794, pl. xlviii. fig. 21.

This animal is jet-black throughout, with a pale band on the upper part of the neck running to the base of the eye-tentacles. There are no right or left shell-lobes; the right and left neck-lobes ample, the last not divided. Pallial margin as usual. Lingual ribbon and jaw as in *E. jucunda*, as also the generative organs.

Everettia bocki, Issel, Ann. Mus. Civ. Genova, vi. p. 399.

Hab. Borneo (*Carl Bock*).

MICROCYSTIS TERSA. (Plate IV. fig. 1.)

Nanina tersa, Issel, Ann. Mus. Civ. Genova, vi. p. 399, t. v. figs. 1–4 (1874).

Shell globose, thin, transparent glassy, very narrowly perforate; sculpture, no spiral striation except near the apex and that most minute; colour pale sienna tint; spire conical, sides flat; apex blunt; suture shallow, adpressed; whorls 5, regularly increasing and rather flat: aperture semi-ovate; peristome subvertical, sharp, scarcely reflected at the oblique columellar margin.

Size: maj. diam. 7·6, min. 7·5; alt. axis 4·6 millim.
Hab. Busan Hills (*A. Everett*).

Microcystis (?) *macdougalli.*

Nanina (?) *macdougalli*, Issel, Ann. Mus. Civ. Genova, vi. p. 400, t. v. figs. 9–12 (1874).

MICROCYSTIS DYAKANA, n. sp. (Plate IV. figs. 4, 4 *a*–4 *c*.)

Shell globose, thin, semi-transparent, very narrowly perforate, almost imperforate; sculpture, under high lens very minute, somewhat wavy spiral striation, to the naked eye smooth and glassy; colour pale dull ochraceous; spire moderately high; apex blunt; suture adpressed, shallow; whorls 4, convex, rather rapidly increasing; aperture semi-ovate; peristome sharply edged, reflected at the columellar margin, which is oblique, not thickened.

Size: maj. diam. 8·7, min. 7·7; alt. axis 4·5 millim.
Hab. Busan Hills (*A. Everett*).

This might very easily be mistaken for *Microcystis tersa* but for its larger size and fewer whorls, the form of the apex of the shell when viewed from the front being also very different.

The animal is of a pale ruddy brown colour with large black patches and spottings.

The right shell-lobe (*r.s.l.*) very ample, triangular in form; the left shell-lobe also large as well as the neck-lobes (figs. 4 *a* & 4 *b*).

The radula was not seen, this part had been destroyed before it was placed in spirit.

The generative organs were also not perfect. The male organ is shown in Plate IV. fig. 4 *c*.

Microcystis (?) *lowi.*

Hyalina (?) *lowi*, Issel, Ann. Mus. Civ. Genova, vi. p. 401, t. v. figs. 16–19 (1874).

Microcystis (?) *perlucida.*

Hyalina perlucida, Issel, Ann. Mus. Civ. Genova, vi. p. 402, t. v. figs. 20–23 (1874).

MICROCYSTIS (?) MILIACEA.

Microcystis (?) *miliacea*, v. Martens, Preuss. Exped. Ost-Asien, Landschneck. p. 268, plate xii. fig. 15.

Liocystis, Nevill, Hand-list, MS. (from Amboyna).

Borneo (*Sowerby*, ex coll. Lombe Taylor, in coll. Indian Mus., Calcutta).

There is a doubt both as regards identification and habitats.

MICROCYSTINA INFANS. (Plate IV. fig. 2.)

Helix infans, Pfeiff. P. Z. S. 1854, p. 290; id. Monogr. Helic. iv. p. 51 (1859), et v. p. 108 (1868); Reeve, Conch. Icon. pl. cci. fig. 1417 (1854).

Nanina infans, v. Martens, Preuss. Exped. Ost-Asien, Landschneck. p. 243 (1867).
Helix adnata, Mousson in coll.

Six specimens in Dr. Hungerford's collection.

The type of this species is in the British Museum, represented by three shells; the largest, I observed, was of another species, and in this Mr. Edgar Smith concurred. On referring to the original description, the dimensions recorded are those of the second sized specimen, and with this Dr. Hungerford's examples agree. The shell removed is evidently a young specimen of *E. jucunda* or an allied form.

MICROCYSTINA ST. JOHNI, n. sp. (Plate IV. figs. 3, 3 *a*.)

Shell depressedly conoid, glassy, narrowly umbilicated, flat below; sculpture under high power shows minute close longitudinal striæ; colour dark chestnut-brown; spire low; apex flattened; suture shallow, adpressed; whorls 5, very flat above; aperture narrowly lunate; columellar margin rather strong, with a spiral twist.

Size: maj. diam. 4·0, min. 3·5; alt. axis 1·25 millim.

Hab. Busan Hills.

I name this species after Mr. St. John, who was one of Rajah Brooke's officers.

MICROCYSTINA PUDENS, n. sp.

Shell depressedly globose, rather flat below, imperforate; sculpture, most minute regular longitudinal striæ under lens, smooth and glassy to the eye; colour dark sienna-brown; spire flatly conic; apex rounded; suture very shallow; whorls 4, very flat, regularly increasing; aperture narrowly ovate; peristome thin, thickening near the oblique columellar margin, it has here a spiral or twisted form.

Size: maj. diam. 4·2, min. 3·9; alt. axis 2·2 millim.

Hab. Busan Hills (*A. Everett*).

It is exceedingly interesting to find this subgenus of Mörch, hitherto only known from the Andamans, where several species occur, ranging so far to the eastward, and it will no doubt turn up sooner or later in some of the intermediate islands.

MICROCYSTINA SECLUSA, n. sp.

Shell globosely conical, shiny, rounded below, imperforate; sculpture, concentric regular parallel striæ, very fine; colour sienna-brown; spire high, side flat; apex bluntly rounded; suture impressed; whorls 5, sides, particularly of the last, very convex; aperture lunate; peristome acute, thin; columellar margin nearly vertical, thickened.

Size: maj. diam. 3·8; alt. axis 2·4 millim.

Hab. Borneo, cave-earth.

Only two specimens of this species were found, and these I picked out of the cave-earth sent home by Mr. Everett to Mr. John Evans some years ago; it has not yet been found living.

MICROCYSTINA CAVERNÆ, n. sp.

Shell depressedly globose, solid, imperforate; sculpture, distant very fine longitudinal striæ, on a smooth surface; colour pale sienna; spire low, apex rounded; suture impressed; whorls 4, rather flat above, the last rounded; aperture ovately lunate; peristome acute, oblique; columellar margin subvertical, thickened, reflected, with a slight twist.

Size: maj. diam. 3·6; alt. axis 1·3 millim.

Hab. Borneo, cave-earth.

The sculpture is exactly similar to the typical species from the Andaman Islands.

SITALA (?) ANGULATA. (Plate IV. fig. 7.)

Trochomorpha (?) *angulata*, Issel, Ann. Mus. Civ. Genova, vi. p. 405, t. v. figs. 5–8 (1874).

Shell pyramidal, with a raised fine rib on the keel of the last whorl, finely perforate; sculpture decussate, the regular oblique fine costulation being crossed by regular spiral lines; colour dark brown, liver tint; spire high, conical with slightly rounded sides; apex blunt; suture impressed; whorls 6, somewhat convex; aperture elongately oval; peristome thin; columellar margin subvertical.

Size: maj. diam. 3·2; alt. axis 2·9 millim.

Hab. Busan Hills (*A. Everett*).

Issel places this in the genus *Trochomorpha* and justly with a query. Its nearest generic position is *Sitala*, as seen in the spiral lines of sculpture. The animal needs examination to ascertain if it is like that of the Indian region.

SITALA EVERETTI, n. sp. (Plate IV. fig. 6.)

Shell depressedly pyramidal, rounded below, imperforate, keeled; sculpture a dull smooth surface; the spiral ribs very fine, 3 on each whorl, evenly distributed, the one above the suture slightly the best seen, close spiral striation at base; colour pale ashy; spire conical, sides concave; apex blunt; suture shallow, marked by a fine thread-like rib extending to the keel of the last whorl; whorls 6, regularly increasing, convex; aperture semi-lunate; columellar margin reflected, oblique.

Size: maj. diam. 7·0, min. 6·7; alt. axis 4·5 millim.

Hab. Niah Hills (*A. Everett*).

This is an undoubted *Sitala*, a genus represented in Burmah and India by *S. infula*, *attegia*, &c. Only one specimen in the collection, among a lot of small Helices.

SITALA SINGULARIS, n. sp.

Shell pyramidal, sharply keeled, not umbilicated, solid; sculpture, 10 fine lirate lines on each whorl; colour bleached; spire high, sides very slightly convex; apex papilliform; suture shallow; whorls 6; aperture semi-lunate, subvertical; peristome acute;

columellar margin perpendicular, with a spiral twist similar to what is seen in *Microcystina*.

Size: maj. diam. 3·0; alt. axis 2·2 millim.

Hab. Borneo, cave-earth.

The peculiar character of this shell is the form of the columella, which is thickened and has a sharply sinuate outline. In other respects it is like *S. gromatica* of the Khasi Hills and Munipur, and *S. haroldi* of the Andaman Islands.

SITALA KUSANA. (Plate IV. fig. 8.)

Trochomorpha kusana, Aldrich, Journ. Cincinnati Soc. N. H. xii. p. 24, pl. iii. figs. 3, 3 *a*, 3 *b* (1889).

Mr. Aldrich has kindly sent me two examples of this shell and some others described by him. I append his original description, as it may not be available to some conchologists:—

"Shell minutely perforate, thin, subtrochiform, light horn-colour, translucid, with about three transverse raised striæ parallel to the suture; whorls six, strongly rounded, the body-whorl non-descending; spire obtuse; base rounded; aperture flattened, ovate, the transverse diameter the largest, peristome acute; columella reflexed at base and partially covering the umbilicus. Diam. 3 mm.; alt. 2 mm.

"Seven specimens received. They differ in size and shape from *angulata*, Issel; both species, however, could just as well be placed with the section *Sitala* of the genus *Nanina*."

This shell belongs to a section of *Sitala* represented in India by *tricarinata*, Nilghiri Hills, *subbilirata* of Little Brother Andaman Island, and *carinifera* of Penang.

One example in Dr. Hungerford's collection (*Sir H. Low*).

SITALA (?) ORCHIS, n. sp. (Plate V. fig. 3.)

Shell dextral, globosely conoid, tumid, narrowly perforate; sculpture transverse, fine equidistant costulation on the whorls, beneath with concentric rather coarse lineation; colour sepia-brown; spire pyramidal, sides slightly convex; apex blunt, rounded; suture well impressed; whorls very convex; aperture semi-lunate, oblique; peristome thin, sharp; columellar margin slightly reflected, weak.

Size: maj. diam. 4·0; alt. axis 2·0 millim.

Hab. Borneo.

This shell was sent from Labuan, where it had been introduced on Orchids collected by Mr. Hose on the mountains. It is very similar in form to *S. recondita* and *S. uvida* from the Khasi Hills, described by me (Land and Freshwater Moll. of India, p. 74).

DURGELLA HOSEI, n. sp. (Plate IV. figs. 5, 5 *a*, 5 *b*.)

Shell very globosely conoid, glassy, thin; sculpture none, a perfectly polished surface; colour very pale horny; spire low; apex rounded; suture adpressed; whorls 4, rapidly increasing, sides much rounded, aperture lunate; peristome slightly reflected on the vertical columellar margin.

Hab. Busan Hills (*Mr. Hose*).

Unfortunately the figure is taken from the worse of the two specimens, which is hardly mature. The shell in spirit was fully grown, but was broken in extracting the animal. It is, however, an easily recognizable species; the spirit-specimen had a strongly marked white callus on the surface of the penultimate whorl within the aperture.

Description of first specimen dissected.—Animal dark coloured, with the pallial margin pale, an overhanging very long hooked lobe above the mucous pore. Right dorsal lobe moderately large, the left anterior dorsal lobe small, black; the posterior pale and extending backwards, thus it is in two lappets (see Plate IV. fig. 5 *a*). A small tongue-like right shell-lobe evidently capable of great expansion flatly over the shell, as it is very solid and contracted in the spirit-specimen; a well-developed flat triangular left shell-lobe. The foot is divided.

This specimen got accidentally brushed off the slide, and the drawing given was made from another not so well preserved; the right shell-lobe is torn and the left destroyed, but it shows the form of the dorsal lobes.

The odontophore (fig. 5 *b*) consists of a central, simple, unicuspid tooth, succeeded by an innumerable number of similar bicuspid teeth, the cusps being of nearly equal length and terminally placed.

The jaw is broad and straight on the cutting-edge.

The odontophore may be compared with that of *Durgella minuta*, described by me from the Khasi Hills (Land and Freshwater Moll. of India, p. 144, pl. xxxix.). But better preserved and fresher specimens are required of these small mollusks, and the anatomy should be also examined soon after death, to enable us to accurately understand how they are related to each other.

Trochomorpha planorbis.

Helix (*Carocolla*) *planorbis*, Less. in Duperrey, Voy. Coquille, Zool. ii. p. 312; Atlas Moll. pl. xiii. fig. 4 (1830).

Helix planorbis, Pfeiff. Monogr. Helic. i. p. 122 (1848), et v. p. 187 (1868); Mousson, Moll. von Java, p. 25, pl. ii. fig. 9 (1849); Ludeking & Smit, Nat. Tijdschr. Nederl. Indie, xxi. p. 97 (1860).

Helix approximata, Le Guillou, Rev. Zool. 1842, p. 139; Pfeiff. Monogr. Helic. i. p. 206 (1848); Reeve, Conch. Icon. pl. cviii. fig. 603 (1852).

Trochomorpha appropinquata, *approximata*, et *javanica*, v. Martens, Monatsber. Akad. Berlin, 1864, p. 267; Pfeiff. Monogr. Helic. v. p. 187 (1868).

Trochomorpha planorbis, Wall. P. Z. S. 1865, p. 408; v. Martens, Preuss. Exped. Ost-Asien, Landschneck. p. 249, t. xiii. figs. 4, 7, 8 (1867).

Var. APPROPINQUATA, v. Martens, Preuss. Exp. Ost-Asien, Landschneck. p. 249, t. xiii. fig. 8 (1867).

Hab. Niah Hills.

Issel gives two other varieties of *planorbis* from Sarawak—*lessoni*, v. Martens, and *nummus*.

TROCHOMORPHA BICOLOR.

Trochomorpha bicolor, v. Martens, Monatsber. Akad. Berlin, 1864, p. 267; id. Preuss. Exped. Ost-Asien, Landschneck. p. 252, t. xiii. fig. 2 (1867).

Helix bicolor, Pfeiff. Monogr. Helic. v. p. 182 (1868).

Nigritella (?) tropidophora.

Helix tropidophora, Adams & Reeve, Zool. Voy. Samarang, Moll. p. 59, pl. xiv. fig. 14 (1850); v. Martens, Preuss. Exped. Ost-Asien, Landschneck. p. 256 (1867); Pfeiff. Monogr. Helic. v. p. 60 (1868).

Helix thais, Pfeiff. Zeitschr. f. Malak. 1849, p. 68; id. Monogr. Helic. iii. p. 37 (1853); Mart. u. Chemn. Conch.-Cab. ed. ii. p. 298, t. cxxv. figs. 32, 33.

Nanina (Trochomorpha) thais, Albers, Helic. ed. ii. p. 60 (1860).

Trochomorpha tropidophora, Wall. P. Z. S. 1865, p. 408.

NIGRITELLA CONICOIDES.

Helix conicoides, Metcalfe, P. Z. S. 1851, p. 71; Pfeiff. Monogr. Helic. iii. p. 37 (1853); Mart. u. Chemn. Conch.-Cab. ed. ii. p. 448, t. cliii. figs. 20, 21; Reeve, Conch. Icon. pl. lxxxiv. fig. 449 (1852); v. Martens, Preuss. Exped. Ost-Asien, Landschneck. p. 256 (1867).

Helix labuanensis, Pfeiff. P. Z. S. 1863, p. 523; id. Monogr. Helic. v. p. 61 (1868); id. Novitat. Conch. xxv. p. 304, t. lxxiv. figs. 4, 5.

Helix vitrea, Bonnet, Rev. Zool. 1864, p. 68, pl. v. fig. 3.

Trochomorpha conicoides, Wall. P. Z. S. 1865, p. 407.

Hab. Niah Hills, Trusan, Tiga Island (*A. Everett*).

Trochomorpha ceroconus.

Helix ceroconus, Pfeiff. P. Z. S. 1863, p. 523.

Patula (Macrocycloides) obscurata.

Helix obscurata, Adams & Reeve, Zool. Voy. Samarang, Moll. p. 59, pl. xiv. fig. 18 (1850).

Helix tradita, Reeve, Conch. Icon. pl. cv. fig. 583.

The figure given in the 'Voyage of the Samarang' is very inferior, and being taken from the back, it would be impossible to identify a species from it.

Fam. HELICIDÆ.

HELIX (ÆGISTA) TOMENTOSA.

Helix tomentosa, Pfeiff. P. Z. S. 1854, p. 289; id. Monogr. Helic. iv. p. 271 (1859), et v. p. 353 (1868); Reeve, Conch. Icon. pl. cxcix. fig. 1403 (1854); v. Martens, Preuss. Exped. Ost-Asien, Landschneck. p. 275 (1867); Issel, Ann. Mus. Civ. Genova, vi. p. 406 (1874).

A banded variety and single specimen from Sarawak. From Karamon Island is a single specimen, all dark brown, larger than the last, with a smaller umbilicus; there is very little difference in form.

Helix (Ægista) pudica, n. sp. (Plate II. figs. 7, 7 *a*.)

Shell depressedly conoid, subangulately keeled, narrowly umbilicated, hidden by the columellar reflection; sculpture, a slightly roughened or shagreen-like surface; colour pale ochraceous, with a snowy-white peristome; spire flatly conoid, low; apex rounded; suture shallow; whorls 4, sides flat, a shallow depression near the periphery; aperture semi-lunate; peristome reflected on outer margin and thickening towards the columellar margin, which is oblique.

Size: maj. diam. 20·0, min. 15·8; alt. axis 7·75 millim.

Hab. Labuan (*Sir H. Low*, in coll. Dr. Hungerford).

Helix (Ægista) grumulus, n. sp. (Plate V. fig. 2.)

Shell depressedly conoid, keeled, widely umbilicated; sculpture, a rough epidermis covered with small spots in relief; the periphery set with regular, short, thick-based hairs; colour ochraceous; spire flatly pyramidal; side slightly convex; apex rounded; suture shallow; whorls 5, sides flatly convex; aperture semi-lunate; peristome slightly reflected; columellar margin subvertical.

Size: maj. diam. 8·5, min. 7·8; alt. axis 3·5 millim.

Hab. Borneo (in spirit), exact locality unknown (*A. Everett*).

This is the nearest approach to the *Helix huttoni* group of India that I have seen from this island; the odontophore is like that of *Helix*; the mantle-margin is simple.

Helix (*Plectotropis*) *winteriana.*

Helix winteriana, Pfeiff. Symb. ad Hist. Helic. ii. p. 41 (1842); Issel, Ann. Mus. Civ. Genova, vi. p. 407 (1874).

Hab. On west coast at Mampawa and Benkajang.

Helix (Chloritis) quadrivolvis.

? *Helix unguiculastra*, v. Martens, Monatsber. Akad. Berlin, 1864, p. 524.

Helix quadrivolvis, v. Martens, Monatsber. Akad. Berlin, 1865, p. 53, =*flexuosa*, Pfeiff. P. Z. S. 1855, p. 112.

Hab. West coast Borneo, Mandhor.

Many examples from cave-earth (*Everett*).

Helix (Chloritis) meander, n. sp. (Plate II. figs. 2, 2 *a*.)

Shell dextral, discoid, inflated, deeply and openly umbilicated; side of umbilication subangular; sculpture of a rough papery texture; colour dull umber-brown, with a broad white band following the suture, peristome pinkish; spire low; apex flat, slightly ascending above the body-whorl; suture rather shallow; whorls 4, rounded on the periphery; aperture widely ovate, perpendicular; peristome reflected, slightly sinuate below; columellar margin subvertical.

Size: maj. diam. 16·2, min. 13·0; alt. axis 6·0 millim.

Hab. Mulu Mountains (*Boxall*, in coll. Dr. Hungerford).

This is allied to *H. quadrivolvis*, v. Martens, which has a narrow coloured band and differs in form. I have named it after H.M. frigate 'Meander' which did much good service in Bornean waters in the early days of Rajah Brooke's occupation.

HELIX (CHLORITIS) PLENA, n. sp. (Plate II. fig. 8.)

Shell depressedly globose, openly umbilicated; umbilical margin hollow, subangular; sculpture finely granulate, covered with a strong epidermis; colour pale umber-brown, with a faint indication of a peripheral band; spire low; apex flat, slightly raised above the body-whorl; suture shallow; whorls nearly 5, gradually increasing; aperture oval, nearly vertical; peristome milky white, reflected; columellar margin suboblique.

Size of specimen drawn: maj. diam. 18·8, min. 15·5; alt. axis 8·5 millim.

Largest specimen: maj. diam. 19·0, min. 16·0; alt. axis 8·9 millim.

Hab. Labuan (*Sir H. Low*, in coll. Dr. Hungerford).

There were five examples of this shell in the collection.

Helix (Camena) germana.

Helix germana, Reeve, Conch. Icon. pl. lxxiv. fig. 385 (1852), =*H. orientalis*, Adams & Reeve (non Gray), Zool. Voy. Samarang, Moll. p. 61, pl. xvi. fig. 4 (1850).

This is evidently not Bornean.

Helix (Papuina) antiqua.

Helix antiqua, Adams & Reeve, Zool. Voy. Samarang, Moll. p. 61, pl. xiv. fig. 1 (1850).

HELIX (GEOTROCHUS) NIAHENSIS, n. sp. (Plate II. fig. 3.)

Shell dextral, pyramidal, thin texture, base flat; sculpture, spiral liræ, fine, regular, not of continuous thickness, crossed by lines of growth; colour white, with some fine marbling in a greyer colour within the aperture, porcellaneous white; spire high, pyramidal, sides slightly concave; apex acuminate; suture fine, linear; whorls 7, very flat; aperture ovate, wide and ample, oblique; peristome sharp, coming to an angulate form at the outer keeled margin, expanded and thickened below towards the columellar side.

Size: maj. diam. 18·8, min. 16·0; alt. axis 12·3 millim.

Hab. Niah Hills (*A. Everett*).

Only one specimen of this delicately formed and gracefully shaped shell was in the collection.

HELIX (GEOTROCHUS) TIGAENSIS, n. sp. (Plate II. fig. 5.)

Shell pyramidal, rounded below, narrowly umbilicated; sculpture, irregular transverse lines of growth, indistinct concentric striation on base; colour very pale ochre throughout; spire pyramidal, sides flat; apex blunt; suture linear; whorls 6, very flat; aperture semi-lunate; peristome reflected upon the columellar margin, which is very oblique.

Size: maj. diam. 9·3; alt. axis 8·0 millim.

Hab. Tiga Island, Borneo (*A. Everett*).

Only one specimen in the collection.

HELIX (GEOTROCHUS) SUBFLAVA, n. sp. (Plate II. fig. 4.)

Shell pyramidal, keeled, rather flat on the base, narrowly perforate; sculpture, rough papillate dottings arranged transversely; colour ochre; spire high, sides flat; apex very blunt; suture linear; whorls 6, sides flatly convex; aperture quadrate; peristome very thin; columellar margin much reflected, perpendicular.

Size: maj. diam. 7·0; alt. axis 6·5 millim.

Hab. Borneo (*Sir H. Low*, in coll. Dr. Hungerford).

This is the first species of this genus found in Borneo. The type species is from Ternate, and the genus ranges through New Guinea to the Solomon Islands, where it appears to be abundant; whether the animal is the same throughout this extended distribution is yet to be found out.

Helix pulvisculum, Issel, Ann. Mus. Civ. Genova, vi. p. 406, t. v. figs. 24–27 (1874).

Locality not given.

There are some species of *Helicostyla* and *Cochlostyla* represented in Mr. Everett's collection, but these are from Palawan. As this is a large island with a Molluscan fauna somewhat different from that of Borneo, I think it better to record them in a separate paper, in which I shall describe the shells from Palawan collected by Mr. J. Whitehead.

COCHLOSTYLA JAYANA.

Hab. Lobok Antu, Batang Lussen District (*Hose*).

DESCRIPTION OF THE PLATES.

Explanation of the Abbreviations.

Al.Gd. Albumen-gland.
ant. Anterior.
C. Central tooth.
D. Dart-sac.
d. Calcareous dart.
E. Retracted eye-tentacles.
Gen.Ap. Generative aperture.
h.d. Hermaphrodite duct.
K. Kalc-sac.
l.d.l. Left dorsal lobe.
l.s.l. Left shell-lobe.
M. Mouth.
M.G. Mucous gland.
m.G.D. Mucous gland of dart-sac.
ov. Oviduct.
P. Penis.
P.Ap. Penis aperture.
post. Posterior.
r.d.l. Right dorsal lobe.
r.m. Retractor muscle.
r.m.P. Retractor muscle penis.
r.s.l. Right shell-lobe.
Res.Ap. Respiratory aperture.
Res.Or. Respiratory organ.
Sp. Spermatheca.
Sp.Ap. Spermatheca aperture.
v.d. Vas deferens.
x. Position of calcareous dart.

Plate II.

Fig. 1. *Dyakia busanensis*, × 1·5, p. 31.
2, 2 *a*. *Helix* (*Chloritis*) *meander*, × 2·5, p. 43.
3. —— (*Geotrochus*) *niahensis*, × 2·5, p. 44.
4. —— (——) *subflava*, × 2·5, p. 45.
5. —— (——) *tigaensis*, × 2·5, p. 44.
6. *Dyakia moluensis*, × 1·5, p. 33.
7, 7 *a*. *Helix* (*Ægista*) *pudica*, × 2·5, p. 43.
8. —— (*Chloritis*) *plena*, × 4, p. 44.

Plate III.

Fig. 1. *Everettia jucunda*, Pfr., × 1·5, p. 34.
2. —— ——, var. *depressa*, × 1·5, p. 35.
3. Portion of radula, central teeth, × 330, p. 34.
3 *a*. Ditto, 50th, 51st, and 52nd laterals, × 330, p. 34.
3 *b*. Ditto, from another specimen, the central tooth not so worn, × 360, p. 34.
4. Jaw, × 12, p. 34.
5. Extremity of foot, side view, × 4, p. 33.
5 *a*. Ditto, view from behind, showing mucous gland, × 4, p. 33.
6. Generative organs, × 4: *D*. Amatorial organ or dart-sac; *d*., the calcareous dart, p. 33.
6 *a*. Mucous glands of the above, further enlarged, × 7, p. 33.
6 *b*. The dart enlarged, × 7, p. 33.

Plate IV.

Fig. 1. *Microcystis tersa*, Issel, × 4, p. 36.
2. *Microcystina infans*, Pfr., × 4, p. 37.
3. —— *st. johni*, × 7, p. 38.
3 *a*. —— ——, columellar margin enlarged, p. 38.
4. *Microcystis dyakana*, n. sp., × 4, p. 37.
4 *a*. —— ——, animal from spirit-specimen, showing dorsal and shell-lobes, right side, × 4, p. 37.
4 *b*. Ditto, ditto, view of left side, × 4, p. 37.
4 *c*. Part of generative organs, p. 37.
5. *Durgella hosei*, n. sp., peristome imperfect, × 7, p. 40.
5 *a*. The mantle-margin taken off, showing the different lobes, p. 41.
5 *b*. Central teeth of radula, p. 41.
6. *Sitala everetti*, n. sp., × 4, p. 39.
7. —— *angulata*, Issel, × 7, p. 39.
8. —— *kusana*, Aldrich, × 7, p. 40.

Plate V.

Fig. 1. *Helicarion whiteheadi*, n. sp., nat. size, p. 24.
2. *Helix* (*Ægista*) *grumulus*, n. sp., × 4, p. 43.
3. *Sitala orchis*, n. sp., × 7, p. 40.
4. *Dyakia nasuta*, Metcalfe, the generative organs of, enlarged, p. 32.
4 *a*. The amatorial organ, further enlarged, to show the mucous glands, p. 32.
4 *b*. Central teeth of radula, × 220, p. 32.
4 *c*. The 80th and 81st laterals, × 360, p. 32.
5. *Dyakia hugonis*, Pfr., generative organs; *x*, position of the calcareous dart, p. 30.
5 *a*. The posterior end of amatorial organ, much enlarged, to show the form of the *sagitta amatoria*, p. 30.
5 *b*. The latter, × 12, p. 30.
6. *Xesta glutinosa*, Metcalfe, edge of mantle taken off, showing the dorsal and shell-lobes, p. 25.
6 *a*. Generative organs.
6 *b*. The male organ, much enlarged, to show the difference between this genus and *Macrochlamys*, p. 25.

PLATE VI.

Fig. 1. View on the side of respiratory orifice of *Rhysota* (?) *brookei*, showing the dorsal lobe and left shell-lobe (*l.s.l.*), from spirit-specimen, nat. size, p. 28.
2. Mantle-margin, showing the contracted right shell-lobe and the anterior and posterior right dorsal lobes, p. 28.
3. The right shell-lobe, enlarged 2·5, viewed from above, p. 28.
3 *a*. View of same from below, nat. sze, p. 28.
4. Extremity of foot, seen from above, × 2·4, p. 28.
5. Animal removed from the shell; spirit-specimen. *E*, retracted eye-tentacles; *M*, mouth; *P.Ap.* and *Sp.Ap.*, the generative aperture, with the orifices of the male organ and spermatheca, nat. size, p. 28.
6. Generative organs, nat. size. *h.d.*, hermaphrodite duct; *Al.Gd.*, Albumen-gland; *ov.*, oviduct; *r.m.P.*, retractor muscle penis, p. 28.
7. Jaw, × 4, p. 29.
8. Teeth of radula, centrals, × 340, p. 29.
8 *a*. Outermost laterals, × 340, p. 29.
9, 9 *a*. Young shell, natural size, pp. 27, 28.

January 20, 1891.

W. T. Blanford, Esq., F.R.S., F.Z.S., in the Chair.

Mr. Sclater exhibited specimens of three species of Purple Water-hens (*Porphyrio poliocephalus*, *P. cæruleus*, and *P. smaragdonotus*), and made the following remarks:—

In 1879 ('Ibis,' 1879, p. 196) I pointed out that the *Porphyrio* of Southern Europe (*Porphyrio hyacinthinus* of Temminck, but of which a prior name was *cæruleus* of Vandelli) had no claim to the title "*veterum*," which had been applied to it by G. R. Gray (from a misunderstanding of a footnote in S. G. Gmelin's 'Reise durch Russland'), and that Mr. Dresser and Mr. Elliot had both gone astray in following Gray's lead. Furthermore I suggested that the bird met with by Gmelin in the south of the Caspian would probably turn out to be the Indian species *P. poliocephalus*, which, however, misled by Schlegel, I called on that occasion *P. pulverulentus*.

That I was right in my conjecture, and that the Caspian *Porphyrio* is really the same as the Indian species, is now well known to us from examination of specimens transmitted from that district by Dr. Radde, some of which, by Mr. Dresser's kind permission, are now on the table before us.

Mr. Seebohm ('Ibis,' 1884, p. 429) was, I believe, the first to show the identity of the Caspian and Indian birds, which I can fully confirm after comparison of the present specimens with Indian skins in the British Museum.

For comparison with the Caspian bird I place on the table examples of *P. cæruleus* from Sardinia and Sicily and of *P. smaragdonotus* from Egypt, kindly lent me for this purpose by Mr. E. C. Taylor.

The latter species, as is well known, also occurs occasionally as a straggler in Sicily (see Giglioli, 'Avifauna Italica,' p. 356). It is, I believe, the only *Porphyrio* found in Egypt, and extends into Southern Africa and Madagascar.

As regards the last-named species, I wish to remark that Temminck was the first to separate *P. smaragdonotus* from its allies, and that it ought to remain under his name (amended). The "*Taléve*" or "*Poule Sultane*" of Buffon, upon which the terms *madagascariensis* and *chloronotus* were subsequently founded, is a composite species composed of *P. cæruleus* and *P. smaragdonotus*, and these names should therefore not be adopted.

The following papers were read :—

1. On an Earthworm of the Genus *Siphonogaster* from West Africa. By Frank E. Beddard, M.A., Prosector to the Society.

[Received January 6, 1891.]

The Authorities of the Royal Gardens, Kew, have kindly forwarded to me some weeks since a box of Earthworms and castings from West Africa.

The worms were preserved in spirit and had been sent to Kew by His Excellency Sir A. Moloney, K.C.M.G., Governor of Lagos; they were collected in the Yoruba country, which lies to the north of Lagos.

A recent number of the 'Kew Bulletin'[1] contains a very noteworthy paper by Mr. Alvan Millson, Assistant Colonial Secretary of Lagos, upon the habits of these Earthworms, which he had himself collected and observed.

Unfortunately the state of preservation of the worms was not good, but I have nevertheless been able to ascertain the genus to which they belong, and to decide that they probably form a new species of that genus.

They are evidently referable to a very remarkable African genus, *Siphonogaster*, which has been quite lately described by Levinsen[2]. His description, although necessarily (through the imperfect preservation of the specimen) incomplete, enables me to describe my species as new. I name it *Siphonogaster millsoni*, after Mr. Alvan Millson.

The most striking character of *S. ægyptiacus*, which is illustrated in the plate accompanying Herr Levinsen's paper (*op. cit.* pl. vii. figs. 1, 2), is afforded by two appendages which are attached to the ventral side of the body upon the xvith or xviith segment. These appendages are of considerable size, nearly one quarter of the length of the entire worm.

Siphonogaster millsoni has the same appendages, which are very much smaller, though the worm itself appears to be longer.

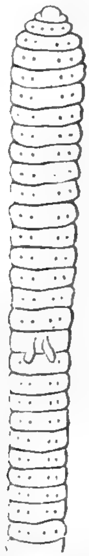
The largest specimen which I examined measured about 14 inches

[1] 'Bulletin of Miscellaneous Information,' no. 46, Oct. 1890, pp. 238–244.

[2] "Om to nye Regnormslaegter fra Aegypten," Vidensk. Meddel. fra den Naturh. Foren. i Kjöbenhavn, 1889, p. 319.

in length, with a diameter at the widest part of about $\frac{1}{6}$ inch. As the specimens were much softened, this length probably represents the extreme length of the worm in its most extended condition. The colour was almost black at the anterior end; further back a brown tint predominated; the posterior end of the body showed in many specimens a peculiar dark green colour, something like that of *Microchæta rappii*[1]. The appendages in question are as shown in the accompanying drawings (woodcuts, figs. 1, 2), small, not longer

Fig. 1.



Siphonogaster millsoni.

Ventral view of anterior segments, showing the processes of segment xviii.

than two segments; they are directed backwards and appear sometimes as if they were adherent along their whole length to the ventral parietes. In other specimens they hang freely down.

Levinsen is in some little doubt about the number of the segment to which the appendages are attached. In *S. millsoni* they arise without doubt from the eighteenth segment, close to each other and on either side of the ventral middle line.

Their origin is from the middle of the antero-posterior diameter of the segment, just where the ventral pair of setæ would be placed were they developed upon this segment. They correspond, in fact, exactly to the first seta, as may be seen by an inspection of the ventral surface of the worm mounted in glycerine on a slide.

The *setæ* of this species, it should be remarked, are in couples, the distance between the individual setæ of each couple being considerable—greater in the case of the ventral couple.

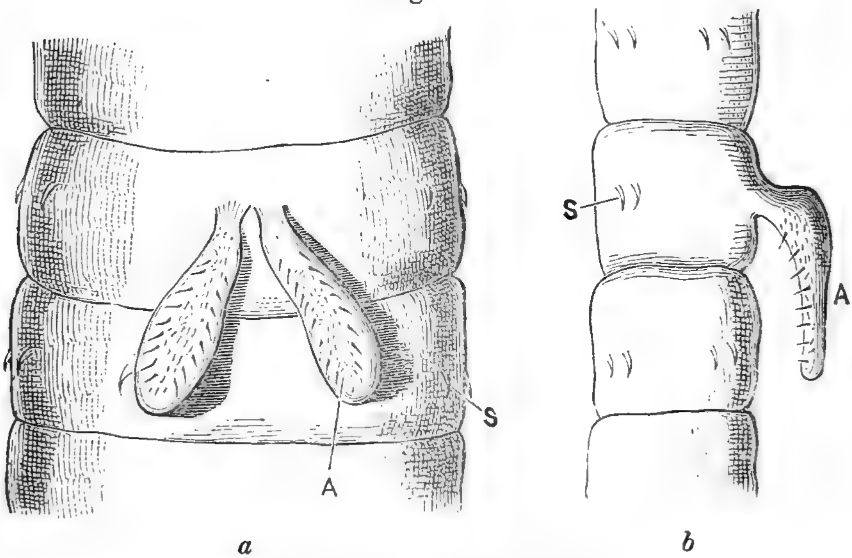
[1] Beddard, "On the Anatomy and Systematic Position of a Gigantic Earthworm, &c.," Trans. Zool. Soc. vol. xii. p. 63, pl. xiv.

On the eighteenth segment, as already mentioned, the ventral couples are absent, but the dorsal couples are present.

The shape of the setæ is very characteristic and is correctly given by Levinsen (*loc. cit.* pl. vii. fig. 6). I could observe no differences, except with regard to size, on any part of the body. Their colour is, however, somewhat remarkable. The setæ of Earthworms are generally of a "horn-yellow" colour. In this species the colour appears to be much the same; but when a seta is viewed with the light passing from below through its entire length it appears distinctly red.

The appendages of the eighteenth segment are of an oval form (fig. 2, *a*, *b*), with a narrow neck connecting them with the body-

Fig. 2.



Appendages of *Siphonogaster millsoni.*

a, ventral view; *b*, lateral view of segments xvii–xx, showing the processes of the body-wall A; *S*, setæ.

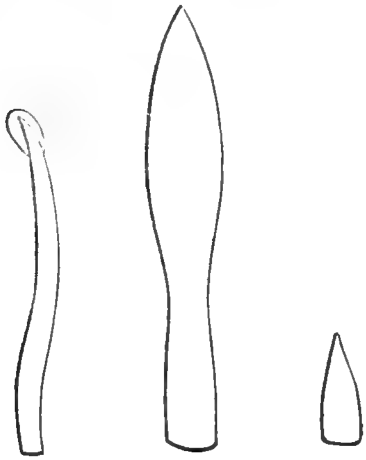
wall; there was no trace of any infolding of the margins such as Levinsen figures.

Each appendage is furnished, as in *S. ægyptiacus*, with a number of peculiar setæ, the shape and arrangement of which is rather different from that which characterizes *S. ægyptiacus*.

In that species there are three or four irregular series of the setæ, beginning at about the end of the first third of the appendage and reaching to its very extremity. In *S. millsoni* the setæ are disposed in two parallel lines, each of which is near the lateral margin of the appendage; they lie upon the posterior surface of the appendage.

The setæ themselves are shaped, as in *S. ægyptiacus*, like a spear-head with a very short shaft; but in *S. millsoni*, as shown in the accompanying drawing (fig. 3, p. 51), which may be compared with Levinsen's figure (*loc. cit.* pl. vii. figs. 3, 5), the "spear-head" is longer than the shaft. Viewed laterally (fig. 3, *a*) each seta is seen to be curved from above downwards. Each of these setæ is invariably accompanied by an immature seta, the form of which can be understood by reference to the accompanying sketch (fig. 3, *c*) without any detailed description.

Fig. 3.



a *b* *c*

Genital setæ of *Siphonogaster millsoni*.

a, seta viewed in profile; *b*, ventral view of seta; *c*, immature seta.

Levinsen naturally regards these structures as copulatory organs, but considers that they may also have a respiratory function; this latter would seem possible on account of their large size and the rich plexus of blood-vessels with which they are furnished.

The small size of the appendages in *S. millsoni* is against their performing a respiratory function in that species, but I quite agree with Levinsen in believing that they are in all probability penes. Their position on the body and the spicules with which they are furnished favour this view.

The genital setæ of this *Siphonogaster* bear a very close resemblance to the genital setæ of *Nais elinguis*, which have recently been figured for the first time by Dr. A. Stolc[1]; the spear-head form and the proportions between the head and "shaft" appear to be nearly identical in the two forms; the curvature, too, exists in both, though it is considerably more pronounced in *Nais elinguis* than in the worm which forms the subject of the present communication.

This case of an Earthworm possessing setæ like those of the lower aquatic forms is very rare; indeed only one other example is known to me—that is, *Urochæta*, in which Perrier first described the

[1] "Přispvěsky ku studiu Naidomorph," SB. böhm. Gesellsch. 1887, p. 227.

general setæ of the body as terminating in a bifid extremity like those of the Tubificidæ and some other families of aquatic Oligochæta. On the other hand, the characteristic *ſ*-shaped setæ of the terrestrial Oligochæta are often found among aquatic genera; it is the converse that is rare.

2. Notes on *Anodon* and *Unio*. By Oswald H. Latter, M.A., formerly Berkeley Fellow of Owens College, Manchester, 1888, late Tutor of Keble College, Assistant Master at Charterhouse. (Communicated by Frank E. Beddard, M.A., Prosector to the Society.)

[Received November 13, 1890.]

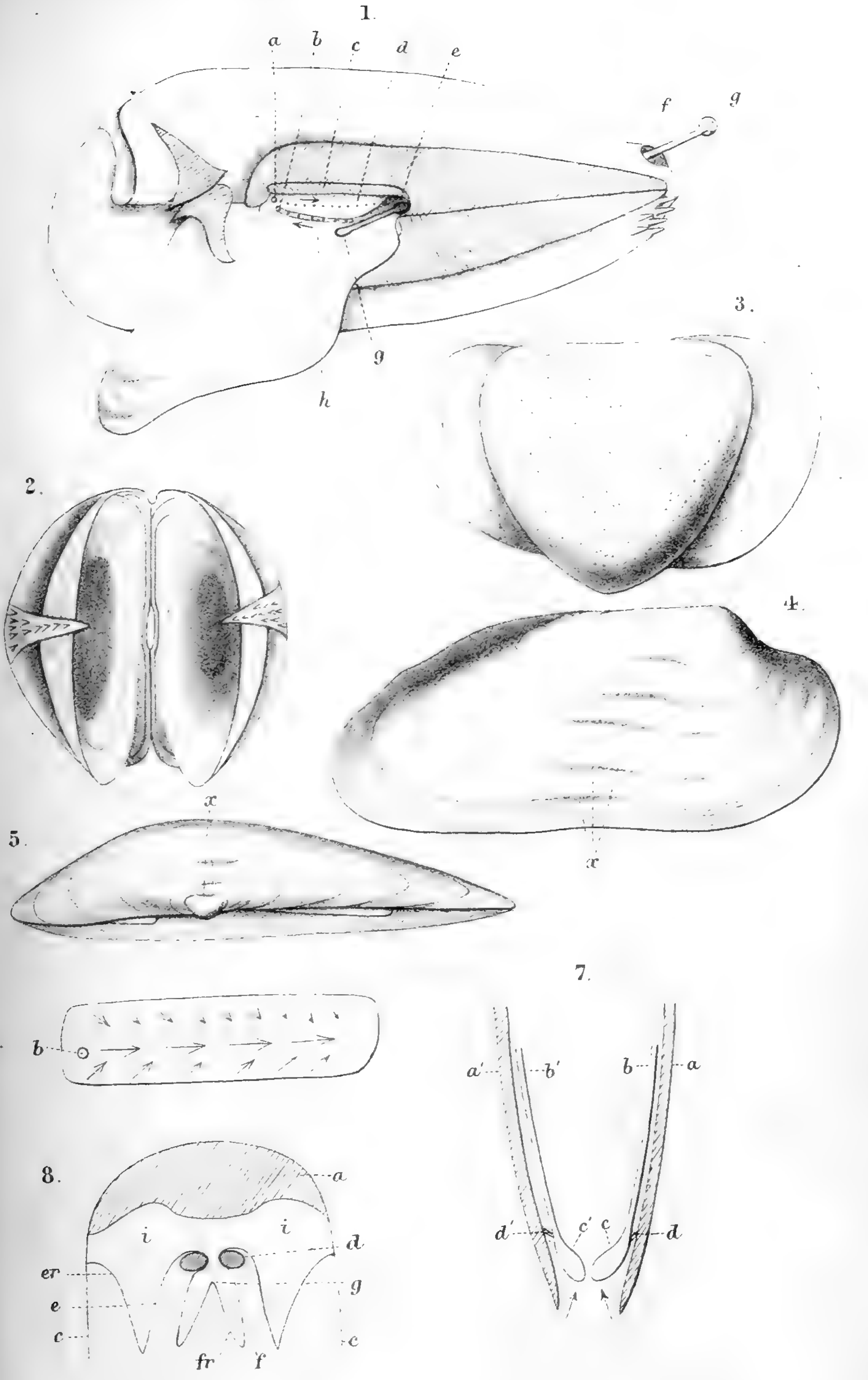
(Plate VII.)

The following observations have been made from time to time during the last two years while working at *Anodon* and *Unio* for other purposes. I have thought it worth while to bring them together and publish them apart from the anatomical and other details which I hope to complete shortly. My investigations were begun in Manchester in 1888, while I held the Bishop Berkeley Fellowship, and I may take this opportunity of thanking the donor of that emolument for the facilities thereby afforded me and also Prof. Milnes Marshall for his kind advice and assistance in many ways.

I. *The Passage of the Ova from the Ovary to the External Gill-plate.*

In 1830 von Baer gave in Meckel's 'Archiv,' 1830, pp. 313–352, an account of this process, which has, so far as I can ascertain, been tacitly accepted by all later writers on the subject. My own observations have led me to somewhat different conclusions. Von Baer's account is briefly as follows:—The ova pass along the inner branchial passage, being prevented from falling into the internal gill-space by the labour contractions of the foot; thence they pass into the cloaca, into which the outer branchial passage also opens. All the muscles of the body are in a state of contraction during the passage of the ova, and furthermore the cloaca is small. In consequence of the muscular contraction the shell is closed and the ova accumulate in the cloaca, a few perhaps being emitted into the water before the closure is complete. The only direction therefore along which the pressure of ova can be relieved is forwards along the outer branchial passage and thus to the external gill-space. It is to be noticed that von Baer does not state that he has *observed* these phenomena, but merely draws his conclusions from the anatomical relations of the various organs.

I have myself observed the passage of ova as far as the cloaca. The genital aperture, as is well known, is situated ventral of and



J. Smit lith.

Mintern Bros: imp.

ANATOMY OF ANODON & UNIO.

somewhat posterior to the external aperture of the nephridium; it is slightly anterior to the commencement of the free detached dorsal border of the inner lamella of the internal gill-plate. The ova may be seen through the thin epithelial covering on the dorsal margin of the foot, passing along the oviduct to the genital aperture. After escaping through this pore they are conveyed backwards along the external surface of the nephridium. This surface is densely covered with cilia borne upon tall columnar cells, with a large oval nucleus lying in their lower portion and resting on a definite basement membrane. In the middle line of the nephridial surface the cilia are longer and drive the ova straight backwards; towards the ventral and dorsal sides of the nephridial surface the cilia are shorter and drive the ova obliquely backwards and towards the line of the longer cilia, so that the latter tend to keep the ova in the middle line where the ciliary currents are strongest. The arrows (Plate VII. fig. 6) show the direction of the currents. The total effect of the cilia is therefore to drive the ova straight backwards along the middle line of the nephridial surface. In the course of about 50 seconds an ovum is thus swept back to the slit between the retractor pedis muscle and the point of fusion of the internal gill-plates. Through this slit the ova pass, meet the stream of ova from the other side of the body, and so reach the exhalant branchial current and the cloaca. The process goes on for several days (10 or 11) in each individual. This being the case, according to von Baer's theory the shell must remain closed during the whole of this period, or, in other words, respiration be suspended for nearly a fortnight. This appears to me incompatible with the continued life of the individual.

In order that the ova may reach their final resting-place there must be some reversal of the respiratory currents. I was unable to detect any reversal of *ciliary* currents by experiments with colouring-matter, and it is improbable that any such reversal occurs. I have, however, observed (*v. infrà*, p. 55) a violent reversion of currents, due, I believe, to suction, during the emission of *Glochidia*. This suction is probably effected by relaxation of the adductors and consequent partial opening of the shell while the right and left mantle-margins are kept in contact so as to block the aperture at all other parts except the two siphonal notches, of which the exhalant in particular remains open. The thickened margins of the mantle thus serve to temporarily close the aperture between the two valves, and, if my explanation be correct, the muscle-fibres of the mantle between the point of attachment of the mantle to the shell and its free border may tend to draw the right and left thickened borders together in the middle line, while also increasing their thickness and offering a more solid resistance to the water. Furthermore, when once the thickened borders of the mantle are in apposition and the shell commences to gape, the pressure on the right and left free borders will tend to drive them even more closely together; for the line of the mantle which is attached to the shell must of necessity follow the outward movement of the valves when gaping commences, and the free borders unite to form a bluntly pointed longitudinal ridge with divergent sides; the pressure of water falls on these divergent sides and drives them together—the whole structure thus acting in the manner of the mitral valve of the human heart. It is probable that the flexible margins of the valves are also driven together by the pressure of water. The diagram exhibited (Plate VII. fig. 7) may make this clearer.

I am inclined to think, then, that a suction of this kind is used to swiftly draw the ova forward into the external gill-plate. Direct observation on this point is well nigh impossible owing to the necessity of disturbing the animal or even partly opening the shell in order to ascertain whether or no ova are in transit. The fact that violent suction does take place in the case of the *Glochidia* is beyond doubt; the exact mode of causing the suction is, for our present purpose, of less importance.

The question naturally occurs, why do not the ova find their way into the internal as well as the external gill? The reason is, I think, twofold. In the first place, the space between the lamellæ of the external gill is considerably greater than that between the lamellæ of the internal gill. In the second place, as I have ascertained by careful dissection of many individuals, the inner lamella of each external gill-plate extends further towards the dorsal surface than the outer lamella of each internal gill-plate, and stretches over towards the middle line so as to greatly diminish or even totally close the aperture leading into the space within the internal gill. In some cases the inner lamellæ of the external gill-plates of the right and left sides actually come in contact with one another in the median line posteriorly [1].

The diagram (Plate VII. fig. 8), which is a modification of Lankester's diagram (Encycl. Brit. 9th ed., Art. "Mollusca," fig. 135 D, p. 690), will make these relations clearer.

II. *The Attachment of the* Glochidia *to the Parent Gill-plate.*

It is well known that the epithelium of the external gill-plate secretes a nutritive mucus in which the young are imbedded and thus retained within the gill. This mode of attachment is, however, not permanent; for if, as is often the case, the *Glochidia* are retained for a long time after they have attained maturity, a large number escape from their egg-capsules, and the so-called "byssus," becoming entangled in the gill-filaments and bars of concrescence, serves to secure them until they are forcibly expelled from the parent. I have found that the number of *Glochidia* in any given parent which have escaped from their egg-capsules varies with the period during which they have been retained since the attainment of pre-parasitic maturity. It thus appears that as the nutritive mucus is used up, and its power of retaining the *Glochidia* within the gill is therefore

[1] This, of course, applies only to the post-pedal portion of the gill-plates. In the region of the foot the "labour contractions" close the space between the lamellæ of the internal gill, as stated by von Baer.

diminished, a secondary mode of attachment becomes of all-importance and is furnished no longer by the parent but by the adult members of the Glochidian family, in whose neighbourhood the mucus has been chiefly absorbed and who alone are provided with fully developed byssus-filaments. This phenomenon is the more interesting as furnishing yet another case of prolonged attachment to the parent of the young of freshwater animals (*vide* Sollas, "On the Origin of Freshwater Faunas," Scientific Transactions of the Royal Dublin Society, vol. iv. ser. ii., 1886).

III. *Emission of* Glochidia.

The female *Anodon* is usually stated to retain the *Glochidia* within the external gill-plates until fish are in the neighbourhood. This is certainly not always the case, for *Glochidia* were frequently emitted in large masses and long cords after I had gently stirred the water in which the Anodons were lying. Schierholz ("Entwick. der Unioniden," Denk. d. kais. Akad. d. Wiss. 1889, lv. pp. 183–214) states that nodular ejection of *Glochidia* is abnormal, due to imperfect aeration of the water and necessity of using the outer gill for respiratory purposes, that normally ejection takes place singly with the egg-capsules (cast off), which float off and leave the larvæ in masses on the bottom. I fear I am unable to endorse this account *in toto*; nodular ejection undoubtedly is abnormal, but ejection in cords I have always found to occur in healthy individuals supplied with well aerated water, and on one occasion have seen it occur in an undisturbed *Anodon* in its native water. It would seem that any disturbance of the water irrespective of fish, if not too violent, provokes emission of the *Glochidia* in a perfectly normal manner.

It is important to notice that the parent is able *to draw back within the shell the long slimy masses of* Glochidia even after they have been ejected a distance of 2 or 3 inches. The importance of this fact I have already mentioned in dealing with the transit of ova. I observed the *Glochidia* on several occasions, in both *Anodon* and *Unio*, thus forcibly made "to enter a second time into their mother's womb."

IV. *Alleged Swimming of* Glochidia.

The belief that *Glochidia* can swim by clapping their valves together "like *Pecten* or *Lima*" appears to be very general in this country, in spite of frequent denials (*e. g.* Schierholz, *loc. cit.*). The extent of the swimming-powers consists solely in "swimming to the bottom"; in other words, *Glochidia cannot swim.* A *Glochidium* normally lies at the bottom of the water on its dorsal surface, the ventral surface being upwards and the "byssus" (so-called) streaming up into the water above. In this position the *Glochidium* lies powerless to move in any direction, and here, too, it dies unless a convenient "host" is in some way brought in contact with its "byssus." If the water is disturbed the *Glochidia* are carried about by currents, but soon fall to the bottom again and are entirely unable to make headway in any direction, even when they are thus temporarily suspended in mid-water.

The *Glochidia* are evidently peculiarly sensitive to the odour (?) of fish. The tail of a recently killed Stickleback thrust into a watch-glass containing *Glochidia* throws them all into the wildest agitation for a few seconds; the valves are violently closed and again opened with astonishing rapidity for 15–25 seconds, and then the animals appear exhausted and lie placid with widely gaping shells—unless they chance to have closed upon any object in the water (*e. g.* another *Glochidium*), in which case the valves remain firmly closed. I found this excitement very useful in procuring *Glochidia* widely open. Flooding with hot corrosive sublimate kills them instantly and the shells remain apart.

V. *Relation of* Glochidium-*shell to Shell of Adult.*

So long ago as 1825 it was pointed out by Pfeiffer (Naturg. deutscher Land- und Süsswasser-Mollusken, Weimar, 1825), and more recently by Kobelt and Heynemann, that the shell of the *Glochidium* sits like a saddle over the dorsal and lateral surfaces of the shell of the young *Anodon* or may be seen in uninjured specimens close to the hinge-line. It has not, however, been noticed, so far as I can ascertain, that this temporary situation of the *Glochidium*-shell has a permanent effect upon the shape of the adult shell. This effect will be at once apparent on referring to Plate VII. figs. 2–5.

About 101 days after first attachment to the host and 25–30 days after quitting the host, the shell-teeth of the *Glochidium*-shell project ventrally towards the median line, and as a consequence impinge upon the ventral border of the at present soft shell of the adult at a point about halfway along its length, the result being that at this point the permanent shell is prevented from growing so fast as elsewhere. The permanent shell at this stage, therefore, has its otherwise symmetrical curve sharply interrupted by an irregular notch pointing towards the dorsal surface (*vide* figs. 2 & 3). *This notch, in the vast majority of cases, persists through life* and causes a slight dorsal turn of the curves marking the lines of growth at a point roughly halfway along their length, but, as a rule, slightly nearer the posterior border of the shell. In each successive line of the growth the notch becomes of greater antero-posterior and less dorso-ventral extent, thus tending to become less evident and to disappear. The notch can therefore be seen most easily near the hinge-line (*i. e.* on the first lines of growth) in those shells which have escaped corrosion. In 15 species of *Unio* belonging to the Collection of Admiral Sir John Harvey in the University Museum, Oxford, this notch is evident and undoubtedly caused in the way above described; it is perhaps present in 2 others (*U. cylindricus* and *U. triangularis*), and is quite clear also in 6 species of *Anodon*. The figures given by Chenu in his 'Manuel de Conchyliologie,' and by M. Henri Drouet, "Unionidæ du Bassin du Rhône," Mém. de l'Acad. des Sci. Arts et Belles-Lettres de Dijon, (4) i. 1888–89, pp. 27–113, pls. i.–iii., show the notch almost without exception. I do not rely strongly on these figures for this particular, as many irregularities of curvature occur, owing to individual injury at some period of life, and it is necessary to examine each specimen personally before deciding whether the notch figured can in every case be assigned to the Glochidian shell-teeth.

I may take this opportunity of corroborating Schierholz's statement (*loc. cit.*), concerning the absence of sexual distinction in the shape of the shell. It is commonly believed that the shell of the female is far more convex and of greater transverse diameter than that of the male. This is not the case: there is no point by which the shell of the female can be distinguished. On several occasions I have requested persons professing to be able to distinguish the sexes in this way to select a few males from my stock: out of 19 thus selected on various occasions only one proved on dissection to be of the male sex, whereas on one occasion a small *U. pictorum*, which was selected as "undoubtedly female" turned out to be a male! I have invariably found males very rare and was long unable to procure one; for instance, of 50 Anodons dredged from a small pond in Norfolk, and averaging between 3 and 4 inches in length, only two were males; the same was true for Anodons and Unios collected out of the canal at Oxford, though here the proportion of males was slightly higher. So rare in fact were the males and so small were the majority of them, that I was tempted to believe that *Anodon* is hermaphrodite, functioning in early life as male and later as female; I made several experiments to investigate this point, but obtained no evidence on either side. Stress of work has prevented me from making any further search in this direction.

VI. *The Cilia on the Foot of Young* Anodon.

While observing young Anodons of 3–6 weeks old (dating from the end of parasitic life), I was struck by the peculiar movements of the cilia covering the foot. While the animal is in motion the foot is first protruded somewhat slowly until it stretches a considerable distance in front of the anterior margin of the shell, the cilia all the while moving with great rapidity and appearing to "feel the way." The foot having been protruded to its utmost extent, the shell is drawn forward by a rapid muscular contraction. As soon as this contraction commences, the cilia suddenly cease moving and stand out from the surface like the bristles of a brush absolutely motionless and rigid. This condition is maintained until the foot again commences to glide forward. I can offer no suggestion as to the meaning or cause of this apparent rigidity other than that the appearances are as though the pressure within the epithelial cells becomes so great that the cilia cannot assume any other position than one perpendicular to the surface, and forming a continuation of the long axis of the cells on which they are severally carried.

VII. Glochidia *distasteful to Fish.*

All fish with which I have experimented, viz. Perch, Loach, Stickleback, Minnow, have a strong dislike for *Glochidia* as an article of food. They frequently seize a mass of *Glochidia* floating in the disturbed water, but the mass is no sooner within the mouth than it is forcibly and emphatically rejected, being spit out to a considerable distance and very rarely (only once) attempted again. I do not think that it is the irritation caused by *Glochidia* attaching themselves to the inside of the mouth which makes the fish behave thus, for I killed six fishes which had tasted *Glochidia* within ten minutes of making the experiment, and in only one of them did I find a *Glochidium* attached to the mouth. There must, I think, be some unpleasant odour or taste about the *Glochidia*; or possibly the "byssus," the shell-teeth, or both these latter combined, may serve to make the *Glochidia* uninviting morsels.

VIII. *Powers of Resistance of Adult* Anodon *and* Glochidia.

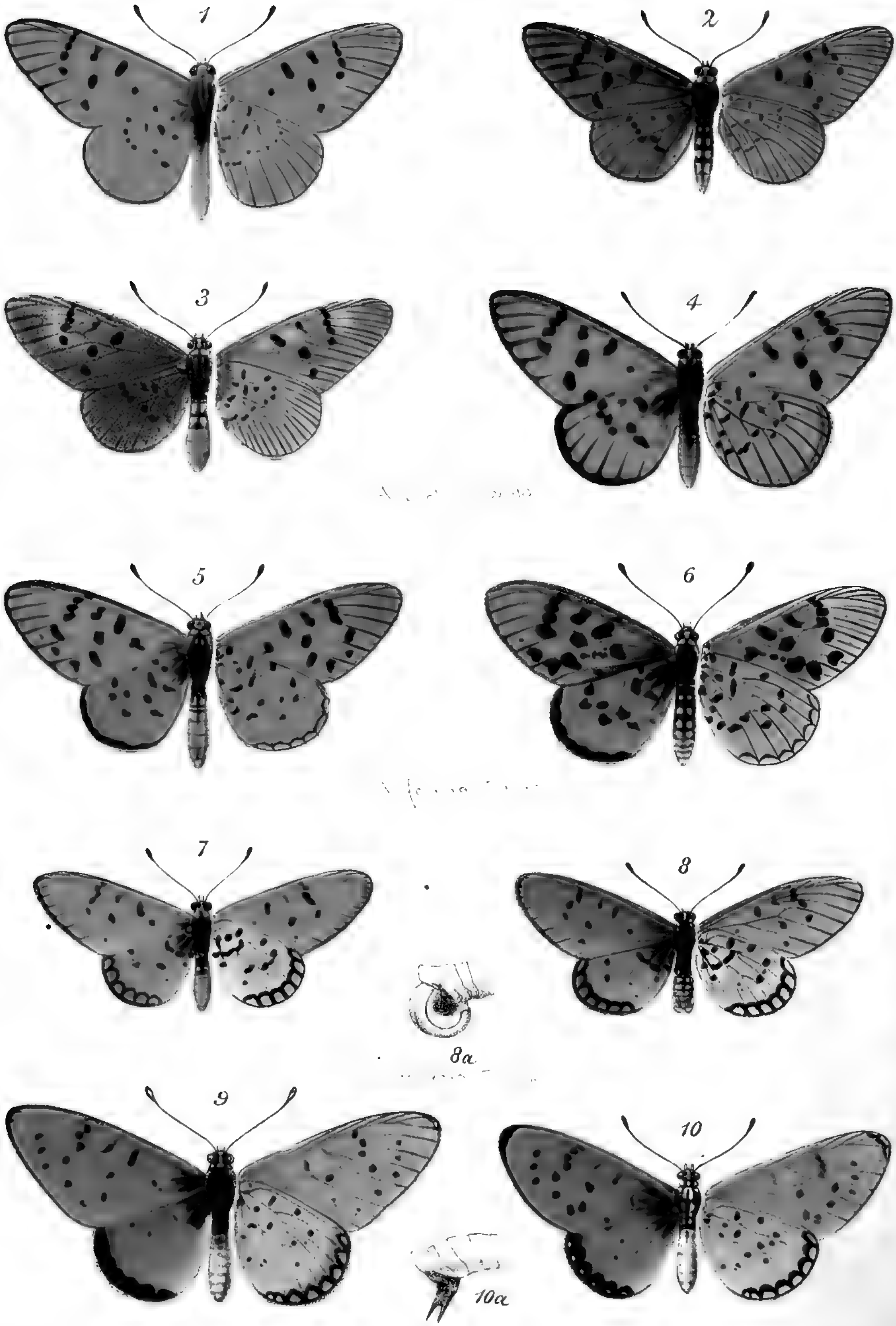
An adult *Anodon* will live for at least a week, in cold weather, after it has been removed from the shell. I consider the animal alive so long as the cilia are beating and the heart is pulsating or capable of responding to a moderate stimulus. The *Glochidia* will live for a day or two within the gill of an apparently dead parent. I was very much interested to notice one morning after a severe frost that the water in the dissecting-dish where an *Anodon* lay removed from its shell was completely frozen. I allowed the frozen mass to thaw gradually, and then examined the animal and its *Glochidia*; both were quite alive and none the worse for their severe exposure. I allowed the same animal and its young to be again frozen the following night, and obtained the same result. This power of being frozen and recovering must be of great importance in preserving the species in many of our shallower ponds and streams which are frequently frozen to the bottom in severe weather.

EXPLANATION OF PLATE VII.

Fig. 1. Diagram of *Anodon* to show course of ova. The left mantle-flap has been reflected towards the dorsal surface and also the left gill-plates. The free dorsal margin of the inner lamina of the internal gill-plate has been turned up to show the surface of the nephridium (organ of Bojanus). *a*, external nephridial aperture; *b*, genital aperture; *c*, reflected free portion of dorsal margin of inner lamina; *d*, ciliated external surface of nephridium; *e*, retractor pedis muscle; *f*, exhalant siphonal notch; *gg*, probe passed through from lower to upper division of subpallial chamber, passing out at *f*; *h*, oviduct. The arrows indicate the direction in which the ova pass.

2. Ventral view of shell of young *Anodon*, 101 days after first attachment to host and about 25–30 days after the end of parasitic life. The *Glochidium*-shell is shown outside the permanent shell, and the shell-teeth project inwards towards the middle line in such a way as to press upon and constrict the permanent shell at a point about half-way along its length.

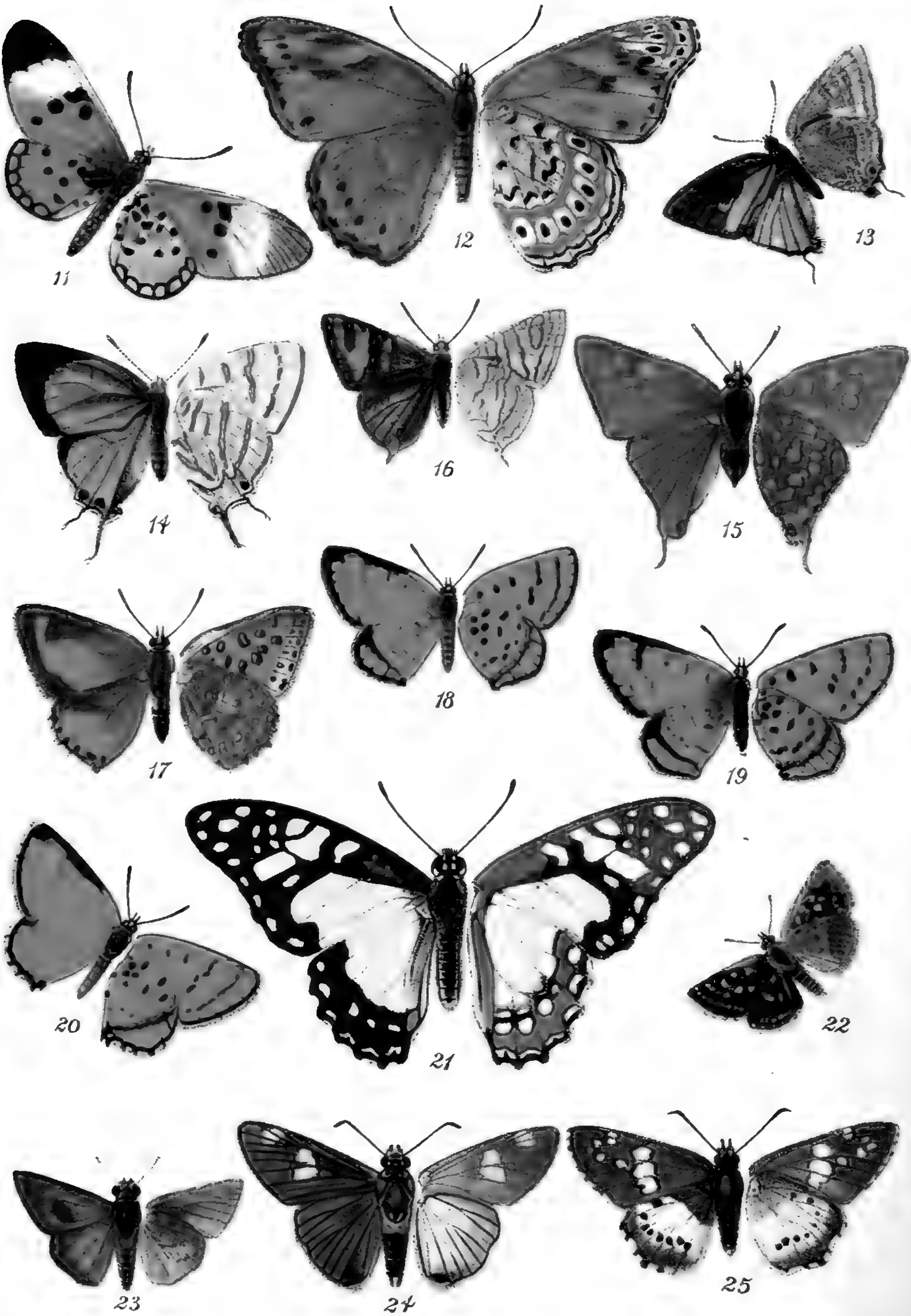
3. Lateral view of somewhat older *Anodon*.



W. Purkiss lith.

Hanhart imp.

NEW BUTTERFLIES FROM TROPICAL SOUTH WESTERN AFRICA.



W. Purkiss lith. Hanhart imp.

NEW BUTTERFLIES FROM TROPICAL SOUTH WESTERN AFRICA.

Figs. 4 & 5. Lateral and dorsal views respectively of left valve of small adult *Unio*, showing the notches, *x*, produced on each line of growth by the previous constriction caused by the shell-teeth of the *Glochidium*-shell.

Fig. 6. Diagram to show the direction of ciliary currents on external surface of nephridium.

7. Diagram to show valvular action of ventral edge of mantle-flaps. *a*, *a'*, right and left valves of shell; *b*, *b'*, right and left mantle-folds; *c*, *c'*, thickened margins of *b*, *b'*; *d*, *d'*, lines of attachment of *b*, *b'* to *a*, *a'*. The arrows indicate the direction of water-pressure.

8. Diagram of relation of gill-lamellæ to show how the ova are prevented from falling into the internal gill. *a*, visceral mass; *c*, mantle-flap; *d*, axis of gill; *e*, inner, *er*, outer lamella of external gill-plate; *f*, outer, *fr*, inner lamella of internal gill-plate; *g*, line of concrescence; *i*, suprabranchial space of subpallial chamber.

3. On Butterflies collected in Tropical South-western Africa by Mr. A. W. Eriksson. By Roland Trimen, F.R.S., &c., Curator of the South-African Museum, Cape Town.

[Received December 8, 1890.]

(Plates VIII. & IX.)

Well known for his many years' experience as explorer and hunter in the tropical Interior, and for the zeal and success with which he has collected and observed the ornithological fauna, Mr. Axel W. Eriksson has latterly, at my instance, turned his attention to the insects inhabiting the less known tracts. The collection of which the Butterflies now under notice formed the larger part was made by him during six months—1st August, 1887, to 25th January, 1888—spent in travelling between Ehanda, in the Southern Ombuela (or Ambuella) country, and Omborombongo, in Central Damaraland.

The country traversed may be said in general terms to be bounded, except to the South-west, by the rivers Cunenè, Okavango, and Omaramba-Oamatako, and it extends from North to South over about five and a half degrees of latitude (15° 15′ to 20° 45′ S.), and from West to East almost the same of longitude (15° to 21° 20′ E.). The route pursued and the time spent in each locality appear from Mr. Eriksson's notes to have been as follows, viz.:—Omrora, "between Ovaquenyama and Ombuela," 1st to 25th August; Ehanda, 26th August to 30th September; Humbe, Cunenè River, October; Omrora again, November; Otiembora, 20th November to 3rd December; the course of the Okavango River, "between the tributaries Omaramba-Caronga and Omaramba-Oamatako," December; the course of the Omaramba-Oamatako, "between its junction with the Okavango and Otjitoë," 2nd to 14th January, 1888; and the course of the same river, "between Otjitoë and Omborombongo," 15th to 25th January. This route is remote from the sea-coast, never approaching it within 200 miles, while its most eastern point (on the Okavango) is distant from it more than 600 miles.

Hitherto, except to some extent as regards Southern Damaraland, the Rhopalocera of this territory have been very little known, and it is thus of interest to place on record a complete list of the species met with by Mr. Eriksson, with notes of any variation observed in the case of species already described, and descriptions of those forms which appear to be new to science.

The collection, consisting entirely of pinned specimens, arrived in excellent condition. I have found it, on careful examination, to contain 125 species, thus distributed among the several families and subfamilies, viz.:—Nymphalidæ (Danainæ 1, Satyrinæ 2, Acræinæ 12, Nymphalinæ 23), 38; Lycænidæ, 40; Papilionidæ (Pierinæ 22, Papilioninæ 4), 26; Hesperidæ, 21.

As was to be expected from its geographical position, and from the absence of any intervening barrier of importance, this country exhibits in its butterflies very intimate alliance with extra-tropical Southern Africa, 97 (or nearly four-fifths) of the species being common to both territories. Although the northernmost part of the country collected in is adjacent to the most southern province of Angola (Mossamedes), there seems to be community of species to but a small extent, only 26 of Mr. Eriksson's species appearing in Mr. Druce's list (Proc. Zool. Soc. 1875, p. 406) of Angolan butterflies collected by the late Mr. J. J. Monteiro, and Dewitz (Nov. Act. Leop.-Carol. Deutsch. Akad. 1879) giving but 32 of them among those brought by Pogge from Central Angola. It is further very noticeable that the characteristic tropical West-African genera *Elymnias*, *Ergolis*, *Godartia*, *Euryphene*, *Euphædra*, *Aterica*, *Harma*, *Abisara*, and *Epitola*, all of which have Angolan representatives, are entirely absent from Mr. Eriksson's collection.

At the same time it must be remembered that the series brought together by Mr. Eriksson contains the captures of only a single half-year, and so cannot be looked upon as completely illustrating what the country produces. In remarkable contrast to the Lycænidæ, which are the best represented group, the *Satyrinæ* and *Papilioninæ* seem to be singularly few.

Of the 28 species not known to occur in extra-tropical areas, 11 appear to be undescribed, viz.:—

(Nymphalidæ.)
(*Acreinæ.*)
Acræa felina.
,, *onerata.*
,, *ambigua.*

(Lycænidæ.)
Deudorix obscuratus.
Aphnæus erikssoni.
,, *modestus.*
Zeritis damarensis.
Erikssonia (n. g.) *acræina.*

(Hesperidæ.)

Pyrgus secessus.
Pamphila obumbrata.
„ *occulta.*

One of these is the type of a new genus of Lycænidæ, near *Zeritis,* which I have called *Erikssonia* after its discoverer. Next to *E. acræina,* the most remarkable of the new forms is *Aphnæus erikssoni,* in which, while the structural characters agree with those of the more brilliantly ornamented section of the genus, the colouring is quite unique and exceptionally plain on both surfaces of the wings.

In addition to the new species, I have noted two marked varieties, viz. in the cases of *Crenis natalensis,* Boisd., and *Papilio morania,* Angas. Seasonal dimorphism is more or less strongly indicated in the cases of *Acræa atolmis, Hypolycæna cæculus, Aphnæus homeyeri, Herpænia eriphia, Teracolus subfasciatus,* and *Callidryas florella.*

Among the 16 remaining species not known to extend into extratropical Southern Africa, 4 are recorded besides from Angola only, 3 from the Upper Zambesi, 1 each from the Umvuli (Mashunaland), Lake Nyassa, Lake Victoria Nyanza, and Querimba ; 4 others combine in their distribution two or more of the above-mentioned localities; and the last (*Charaxes ephyra*) ranges from Mashunaland, south of the Zambesi, to Casamanza, in between 12° and 13° N. lat. on the West Coast.

The rarer or more interesting previously described species are:—*Acræa atolmis, A. atergatis, A. asema, Crenis benguelæ, Crenis concordia, Pseudacræa poggei, Charaxes guderiana, Aphnæus victoriæ, A. homeyeri,* and *Abantis zambesina.*

Family Nymphalidæ.

Subfamily Danainæ.

Genus Danais, Latr.

1. Danais chrysippus (Linn.).

Omrora (August) and Ehanda (September).

The nine examples (only one ♀) are all of the ordinary typical form, but small, the largest expanding 3 in. 3 lin., and the smallest only 2 in. 7 lin.

Subfamily Satyrinæ.

Genus Ypthima, Westw.

2. Ypthima asterope (Klug).

Omrora (August), Ehanda (August and September), and Okavango River (December).

With the exception of a single dwarf male from the Okavango River, the twenty examples (twelve ♂, eight ♀) are larger than usual (exp. al. 1 in. 6–9 lin.), and of a paler, more hoary grey on the underside

—especially on the hind wing, where the dark vermiculated striolation is less developed, and only the median brownish stria apparent. The ocellus of the fore wing varies much in form and size, and the same is the case as regards the ocelli of the hind wing, which also in number vary on the upperside from one to three, and on the underside from two to five (some or all of these latter being often minute, or even reduced to scarcely perceptible fuscous dots). There can, I think, be no doubt that the specimens under notice constitute a variation identical with *Y. granulosa*, Butl. (Ann. & Mag. Nat. Hist. 5th series, xii. p. 101, 1883), from Victoria Nyanza.

Genus Pseudonympha, Wallengr.

3. Pseudonympha bera (Hewits.).

Yphthima bera, Hewits. Ent. M. Mag. xiv. p. 107 (1877).
Neocœnyra[1] *duplex*, Butl. Proc. Zool. Soc. 1885, p. 758.

Okavango River, between Omaramba-Carongo and Omaramba-Matako (December): Omaramba-Matako (January).

Fourteen examples (nine ♂, five ♀) were taken on the Okavango, and one ♀ on its tributary the Omaramba Matako.

I have referred to this *Pseudonympha* in 'South-African Butterflies' (vol. i. p. 82 note, and vol. iii. p. 395), mentioning its relationship to *P. natalii*, Boisd., and its distinguishing features. Mr. Eriksson's specimens differ a little from those taken by Mr. Selous on the Shashani River, in Matabele-land, in the size and form of the subapical pale rufous patch of the fore wing, which in both sexes is less extended inferiorly (in male not far below second median nervule, and in female attaining first median nervule in one example only), more rounded inwardly, and externally much more sharply indented by the dark edging line near its lower extremity. In the female examples the smaller patch in the hind wing is also less developed about the ocelli.

Besides its close alliance with *P. natalii*, Boisd., this butterfly is also nearly related to *P. neita*, Wallengr. (see 'South-African Butterflies,' i. p. 79, pl. 7. f. 2), but easily recognized by its deeper basal and paler hind-marginal colouring, the ferruginous outer ring of the iris of the ocelli, the totally different shape and external dark edging of the pale rufous subapical patch of the fore wing, and the dark submarginal streak in the hind wing, as well as that close to hind-marginal edge in both wings. On the underside, also, *Y. bera* exhibits in the hind wing two well-marked (subbasal and median) dark striæ wholly wanting in *Y. neita*, and very much more developed subbasal ferruginous-rufous marks on costa and inner margin.

[1] I am of opinion that this genus cannot be adopted, all the characters given as distinctive by the founder—while they separate it from *Cœnyra*—being identical with those presented by *Pseudonympha*.

Hewitson's description is not sufficiently detailed to allow of *certainly* identifying his *Yphthima bera* with Mr. Butler's species. Should comparison with the type prove the two to be distinct, Mr. Eriksson's specimens will stand as *Pseudonympha duplex* (Butl.).

Subfamily Acræinæ.

Genus Acræa, Fabr.

4. Acræa atolmis, Westw. (Plate VIII. figs. 1 ♂, 2, 3 ♀, 4 ♂.)

♂. *Acræa atolmis*, Westw., App. Oates' 'Matabele-land, &c.' p. 343, pl. F. ff. 3, 4 (1881).

Var. ♀. *Acræa acontias*, Westw. l. c. p. 345, pl. F. ff. 7, 8.

Omrora (1st to 25th August, and [var. *acontias*] November), Ehanda (26th August to 30th September), Otiembora (20th November to 2nd December [var. *acontias*]), and Okavango River (December [var. *acontias*]).

The male figured and described by Prof. Westwood was evidently not only faded (the fate of all red *Acrææ* within a few months after death) but discoloured. The twenty male examples collected by Mr. Eriksson, exhibited, on 16th July, 1888 (from ten to eleven months after capture), an upperside of *uniform vivid vermilion-red with a very slight rosy surface-gloss*; while on the underside the greater part of the fore wing and the basal internervular marks of the hind wing were of a soft rose-pink, and the internervular rays in the outer part of both wings were reddish orange (as shown in Westwood's figure of the underside of the female *Acontias*). Judging from my experience of other red *Acrææ*, the living *A. atolmis* must be of extreme brilliancy of colour, seeing how exceptionally rich and intense the red remains in specimens nearly a year old.

The spots on the upperside of the male present considerable variation in size and development: in the fore wing, the spot nearest the posterior angle varies much in size, and in three examples is obsolescent, and in four other specimens there is a small additional subbasal spot below median nervure, while two of the last-mentioned four, and two other examples, also display a more or less distinct inner-marginal spot (as usual in the var. *acontias*) beyond the middle; in the hind wing both the subbasal and median series of small spots exhibit every gradation from full development and number (4 and 6 respectively) to fragmentary indication by two or three scarcely perceptible dots. On the underside this variation is not so great, the basal and subbasal spots of the hind wing especially being pretty constant.

The female, of which 10 examples were taken by Mr. Eriksson, agrees with the most strongly-marked males in all the black spots, but exhibits an entirely opposite constancy in those markings; only one of the two occasional additional spots (that on inner margin of fore wing) occurring in one specimen. The colouring is, however, *not only very different from that of the male but also highly variable, from dull reddish ochreous to almost ashy brownish grey,* the intermediate examples being dull ochreous-brown with a rufous tinge. In the fore wing, the apical area is duller and also marked by indistinct internervular dull ochreous rays, while on the inner edge (immediately beyond the four or five upper spots of the discal series) there is an oblique ill-defined *bar of paler ground-colour*, which becomes more expressed in the darker examples, until in the darkest it is *whitish* and conspicuous. On the underside, the pattern is in complete agreement with that of the male, except that in all examples there is more or less narrow representation of the whitish subapical bar in the fore wing; but the colouring is always very much duller, varying in accordance with the tint of the upperside, until in the darkest example there remains no trace of the pink colouring observable in the more reddish specimens.

I place *A. acontias*, Westw., as a variety of *A. atolmis*, because the material (10 male and 7 female examples) afforded by Mr. Eriksson's collection makes its separation—warrantable enough when only a single female example was forthcoming—no longer possible. The males are of a rather less vivid red than the typical male *atolmis*, the females of similar variable dull reddish-ochreous and ochreous-brown tints to those presented by the typical female *atolmis*, except that the extreme form of almost ashy brownish-grey with pronounced subapical whitish bar in the fore wing is not among them. The conspicuous distinction from typical *atolmis* in both sexes is *the enlargement of all the black markings*, viz. the basal suffusion, the cellular and discal spots [1], the hind-marginal edging (especially in the hind wing), and the clouding of the nervules. In connection with the widening of the hind-marginal edging in the hind wing, the underside presents a distinguishing character (mentioned by Westwood in his description of the female), viz., an *additional hind-marginal black line, parallel to and a little before the line actually edging the hind margin*. This feature led me at first to think that *A. acontias* might be kept separate from *A. atolmis*; but on close examination of all the examples of typical *A. atolmis*, I found more or less distinct beginnings of the additional black line in no fewer than two males and five females, its most developed condition—that of a very slender line regularly interrupted on the nervules—being in the generally most heavily black-marked of all the twenty males.

I think it highly probable that we have in this instance a case of seasonal dimorphism, and that *A. acontias* is simply the later (or summer) brood of *A. atolmis*. From the dates furnished by Mr. Eriksson it is clear that typical *A. atolmis* was captured between 1st August and 30th September, while *A. acontias* was taken in November and December (14 of the 17 examples between the 20th November and 2nd December). Two of *A. acontias*—the most heavily-marked male and one of the two most heavily-marked females—were taken in the same locality (Omrora) as the bulk (21 examples) of *A. atolmis* in the preceding August.

Exp. al. (♂) 1 in. 9–11½ lin.; (♀) 1 in. 9–11 lin. Var. *acontias* (♂) 1 in. 10 lin. to 2 in. 1 lin.; (♀) 1 in. 10 lin. to 2 in. 1 lin.

This species occurs as far to the eastward as the Victoria Falls of the Zambesi, 30 miles to the south of which it was taken by Mr. F. U. Barber (who sent me two typical males and one approaching

[1] In the fore wing, of the two additional spots occasionally found in typical *atolmis*, that on the inner margin is invariably present, but the subbasal one is absent in three of the males and in all the females.

the var. *acontias* in 1875), and near which the late Mr. F. Oates also met with it at about the same date. Mr. F. C. Selous also took two typical males in 1889, at a point a little south of the junction of the Chobe and Zambesi.

5. ACRÆA ATERGATIS, Westw.

♀. *Acræa atergatis*, Westw. App. Oates' 'Matabele-land, &c.' p. 342, pl. F. ff. 1, 2 (1881).

Omrora (August) and Ehanda (26th August to 10th September).

This species, of which nine males and six females were collected by Mr. Eriksson, is allied to *A. atolmis* (coming between that species and *A. doubledayi*, Guér.); but the male exhibits none of the brilliant red tint, being but little brighter than the female, which is of about the same reddish ochreous as the least dull females of *A. atolmis*. The male has, however, a tinge of salmon-red, and is further distinguished from the female by larger size, longer fore wings (more produced apically), and longer abdomen, which is silky ochre-yellow, without black spots beneath, and conspicuously white laterally on its apical half (except on the terminal segment). Both sexes of *A. atergatis*, and especially unworn examples, present a singular distinguishing character on the *underside* of the hind wing and of the apex of the fore wing, viz., *an ashy-grey—in very fresh examples a bluish- or violaceous-grey—somewhat shifting surface tint.* The lunulated black line preceding the hind-marginal black edging-line on the underside of the hind wing is exceedingly unstable in both sexes, varying from complete development to a mere trace close to the apex.

Exp. al. (♂) 2 in. $0\frac{1}{2}$–$2\frac{1}{2}$ lin.[1]; (♀) 1 in. 11 lin. to 2 in. 1 lin.

As in the case of *A. atolmis*, the type of this species is a specimen collected near the Victoria Falls of the Zambesi by the late Mr. F. Oates; and a male example taken by Mr. F. U. Barber about 30 miles south of the Falls was sent to me in 1875. In 1889 I received from Mr. F. C. Selous two males captured at a point a little south of the junction of the Chobe and Zambesi.

6. ACRÆA FELINA, n. sp. (Plate VIII. figs. 5♂, 6♀.)

Nearly allied to *A. atolmis* and *A. atergatis*, Westw.

Exp. al. (♂) 1 in. $10\frac{1}{2}$–$11\frac{1}{2}$ lin.; (♀) 1 in. $11\frac{1}{2}$ lin. to 2 in. $0\frac{1}{2}$ lin.

♂. *Pale soft brick-red, with good-sized black spots and narrow black margins. Fore wing*: nervules with black clouding as in *atolmis* and *atergatis*, but *no apical internervular black striæ* as in the latter species; spots in size and general arrangement as in *acontias* var. of *atolmis*, except that (1) the 4th spot of discal series is more beyond the 3rd and strongly crescentic; (2) the 6th spot is not so far beyond the 5th and more elongate; (3) the 7th spot (only faintly present in two specimens) is oblique, slender, and much nearer to base; (4) the subbasal spot below median nervure is much larger and sagittate or strongly crescentic; and (5) *near hind margin there are two additional spots*, one on each side of first median nervule,

[1] A dwarfed male from Ehanda expands only 1 in. $9\frac{1}{2}$ lines.

as in *A. atergatis*, but considerably larger and crescentic; costal and hind-marginal black edging and basal streak and suffusion about as wide as in the *acontias* var. of *A. atolmis*. *Hind wing*: basal black as in *Acontias*, but *no black on nervules*, and position and arrangement of subbasal and discal series of spots like that in *A. atergatis*, except that in the discal series the 7th spot is considerably beyond the 6th; hind-marginal black edging about as wide as in *A. acontias*, but *its inner side unequally indented by ground-colour on nervules. Cilia* creamy white. UNDERSIDE.—Colouring much as in *A. acontias*, but duller as regards the ground-colour of fore wing and the basal and subbasal internervular markings of hind wing, which have scarcely any rose-pink tinge. *Hind wing*: nervules not black; reddish-pink markings before discal series of spots, and submarginal internervular ochreous-orange rays, much reduced, fainter, in one example the latter almost obsolete; black line preceding hind-marginal edging one regularly festooned throughout.

♀. Very like male; markings altogether similar—in one (the darkest) example all larger; ground-colour in one specimen paler, more inclined to salmon-pink, in the other two specimens a good deal duller, tinged with ochreous-brown. UNDERSIDE.—Hind wing and apical area of fore wing of a paler creamy-yellow ground-colour than in male; reddish area of fore wing pinker than in male in the pale specimen, but duller in the brownish-tinged ones.

In two of the males and in the darkest female there is a longitudinal black suffused streak in the fore wing between the subbasal black spot and the 6th spot of the discal series, and in the latter example there is also a fuscous suffusion along the inner margin. This darkest female also presents on the penultimate abdominal segment a rather large laterally-winged horny appendage, which is wholly absent in the two other females [1].

Humbe, Cunenè River (October); Omrora (November); Otiembora (20th November to 3rd December); Okavango River (December).

Four males and three females only were collected by Mr. Eriksson. Both sexes have the fore wings more rounded and less produced apically than is the case in *A. atolmis* and its variety *acontias*, and in comparison with *A. atergatis* this distinction is of course more marked.

7. ACRÆA AXINA, Westw.

♂. *Acræa axina*, Westw. App. Oates' 'Matabele-land, &c.' p. 344. n. 33, pl. F. ff. 5, 6 (1881).

♂ ♀. *Acræa doubledayi*, Guér., var. B, Trimen, S.-Afr. Butt. i. p. 148 (1887).

Omrora (August and November) and Okavango River (December). Five male and three female examples.

On re-examination of the available material, in comparison with that supplied by Mr. Eriksson, I consider that species-rank may be

[1] It is remarkable that not one of the sixteen females of *A. atolmis* and its variety, or of the six females of *A. atergatis*, possesses any traces of a similar appendage. More observations are much needed for ascertaining whether this appendage is congenital in the female *Acrææ* that exhibit it.

accorded to *A. axina*, Westw., as the great difference in size and the absence of the two submarginal spots near the posterior angle of the fore wings appear to be constant over a wide stretch of territory, from Omrora as far eastward as Mashuna-land, and south-eastward to the Limpopo and Marico rivers on the N.W. boundary of the Transvaal. The males captured by Mr. Eriksson agree in their deeper colouring and less transparency much more closely with the description and figures of the two type-specimens from Tati and Gwailo rivers, than they do with the other eastern specimens taken by Mr. Selous at the Shashani River (between those two localities) and at several stations to the south of Tati as far as the Marico. Singularly enough, on the other hand, a Damara-land male, collected by Mr. John A. Bell, closely resembles the paler and more diaphanous examples received from Mr. Selous. The females in Mr. Eriksson's collection are also more warmly coloured and usually larger than the eastern examples, and in them the subapical bar is not white or whitish, but only of a paler tint than the ground-colour. In both sexes, Mr. Eriksson's specimens exhibit much more fuscous basal clouding than any other examples that I have seen; and in this and in their other peculiarities are further from *A. doubledayi*.

Exp. al. (♂) 1 in. 8–11 lin.; (♀) 1 in. 8–10 lin. The females are not only smaller (as usual in this group of *Acræa*), but have a tendency to a dwarfed condition; two of Mr. Selous' specimens expanding only 1 in. 7 lin., and another, as well as one brought from Damara-land by Mr. Bell, reaching an expanse of but 1 in. 6 lin.

8. Acræa onerata, n. sp. (Plate VIII. figs. 7 ♂, 8, 8 *a* ♀.)

Allied to *A. axina*, Westw.

Exp. al. (♂) 1 in. 8 lin.; (♀) 1 in. 8–8½ lin.

♂. *Pale creamy reddish ochreous (a tinge of pink in hind wing), with moderate-sized black spots; hind wing with seven large spots of the ground-colour in rather wide black hind-marginal border.* *Fore wing*: base very narrowly black; a very narrow sublinear costal blackish edging from before middle, somewhat widening at apex; a very narrow hind-marginal blackish edging, becoming finely linear below first median nervule, its inner edge somewhat dentated on the nervules, which are very finely black-marked in apical area and partly so (externally) below that area; black spots in number and disposition as in *axina*, except that the lowest spot in discal series is minute, and, instead of being a little nearer base, lies considerably nearer hind margin than the spot immediately above it. *Hind wing*: basal blackish, darker than in *axina*, and scarcely rising above costal nervure; subbasal cellular spot elongate, crescentic, separate from basal blackish; no spot on upper discocellular nervule; in very irregular discal series of spots the 1st, 5th, and 7th are rather remote from the rest, which are considerably beyond them, and of which the 6th is minute and obsolescent; spots in hind-marginal border very distinct; the first and last smaller than the rest and not rounded. Underside.—*Much paler, of a softer and more creamy tint; in hind wing, an inferior basal patch and the* *enlarged spots of hind-marginal border very pale yellowish. Fore wing*: apical area somewhat tinged with orange-ochreous; apical and hind-marginal edging reduced to a very fine black line, immediately preceded by an interrupted thin streak of very pale yellowish; spots as on upperside. *Hind wing*: a general pinkish suffusion, stronger near base, fades into very pale yellowish a little before hind-marginal border; basal pale yellowish patch marked by five very conspicuous black spots, viz. two (cellular and infra-cellular) close to base, and three (the 2nd, 3rd, and 4th of a strongly curved, almost continuous series of four) subbasal; 6th and 7th spots of discal series more distinct than on upperside; pale spots of hind-marginal border sharply defined and very conspicuous.

♀. *Paler, duller (in one of the two examples not reddish); fore wing with a brownish tinge throughout, and with a wide basal fuscous shade*; hind wing with basal blackish not so dark, but extending to costa and to subbasal crescentic cellular spot; markings as in male. UNDERSIDE.—As in male, but in the duller specimen much fainter in tint, and in the brighter one with the pale yellowish preceding hind-marginal border of hind wing wider. No abdominal appendage in the brighter specimen, *but a singularly large one in the duller specimen,* with such strong anteriorly-recurved lateral expansions as to resemble a short, very broad, partly unrolled haustellum of *Acherontia.*

In addition to the various distinctions from *A. axina* mentioned in the foregoing description, *A. onerata* in both sexes differs in its smaller size, less produced fore wings, and (more especially in the male) much shorter and blunter abdomen; the small spot on costa at base is also wanting in both fore and hind wings; and the internervular subapical fuscous striæ are absent in the fore wings.

The male *A. onerata* also wants the basal fuscous clouding of the fore wings and the white terminal half of the abdomen—both conspicuous features in the male *A. axina.*

Okavango River (December). Three examples: a male and two females.

9. ACRÆA ASEMA, Hewits. (Plate VIII. figs. 9 ♂, 10, 10 *a* ♀.)

Acræa asema, Hewits. Ent. M. Mag. xiv. p. 52 (1877).

Omrora (August), Ehanda (August and September), Humbe (October), and Otiembora (20th November to 3rd December). Twelve male and seven female examples.

As the late Mr. Hewitson (*loc. cit.*) did not sufficiently describe this species, and as the butterfly seems to be still scarce in collections, I think it well to give the following description of both sexes:—

Exp. al. (♂) 1 in. $9\frac{1}{2}$ lin. to 2 in. $1\frac{1}{2}$ lin.[1]; (♀) 1 in. 9 lin. to 2 in.

♂. *Yellow-ochreous (without any red tinge), with small black spots; bases conspicuously but not very broadly suffused with black; hind-marginal black border linear in fore wing (except at apex), but*

[1] Of two dwarfed males, one (from Humbe) expands no more than 1 in. $7\frac{1}{2}$ lin., and another (from Otiembora) only 1 in. 5 lin.

more or less broad in hind wing. Fore wing: basal black variable in width, but always very narrow costally; a transversely elongate subbasal spot (in three examples divided across the middle) below median nervure; a similar marking in discoidal cell about or a little before origin of 1st median nervule, and another, more oblique and usually thinner, at extremity of cell; in the highly-irregular discal series of seven spots, the first four form an *outwardly-arched* narrow subcostal macular bar at some distance beyond cell, the fifth is apart from and a little beyond the 4th, the 6th is much nearer base and situated directly under terminal cellular spot, and the 7th a little beyond the 6th; in three examples an 8th spot (before the 7th) on inner-marginal edge; *a submarginal series of five spots, of which the upper three (between upper radial and 2nd median nervules) are in a straight line directed outward inferiorly*, while the remaining two (of which the lower is usually geminate) are about equidistant from hind margin; a linear black edging along costa; sublinear hind-marginal edging exceedingly attenuated at posterior angle but moderately (in three examples considerably) widened at apex. *Hind wing*: basal black widest on either side of median nervure, and not extending to costal or inner-marginal edge; a spot in discoidal cell beyond its middle; a very irregular discal series of eight spots, of which the 2nd, 3rd, 5th, and 7th (usually geminate) are considerably beyond the rest; all these spots are seldom present, the inferior ones being especially liable to disappear, and in two examples only the minutest traces of two spots are visible; hind-marginal border very variable, not only in its width but in the regular or irregular nervular indentation by ground-colour of its inner edge, and in the presence or absence of 7 dull-yellowish spots (the latter are distinct in two examples, indistinctly traceable in five, and wanting in the remaining five). *Cilia* white in fore wing, whitish in hind wing. UNDERSIDE.—Considerably paler (especially hind wing and apical area of fore wing), with markings mainly as on upperside; but no basal black, and hind-marginal border of hind wing with seven conspicuous yellowish-white spots. *Fore wing*: in examples where apical widened blackish edging is broader than usual, that expansion contains a series of three yellowish-white spots. *Hind wing*: at base itself a black mark; in five examples a small spot close to base on costal lobe; a subbasal discocellular spot, and a curved irregular row of five spots (of which the 2nd is an outer discocellular one).

♀. *Like male, but usually considerably duller and browner in tint, and with hind wing markedly paler; spots not so black; basal suffusion not black but greyish-fuscous, variable in extent (in two examples obsolescent). Fore wing*: the eighth (inner marginal) spot of discal series present in five examples. UNDERSIDE.—Hind wing and apical area of fore wing more distinctly paler than rest of fore wing, in some specimens creamy yellowish. *Fore wing*: in apical area indistinct yellow-ochreous internervular rays.

Abdomen in both sexes white, tinged with canary-yellow laterally and ventrally; but dorsally, from base to a point on third segment, black in male, and fuscous, marked basally with two white spots, in female. Inferior corneous appendage on penultimate segment present in six of the seven females, but perfect in two only; very singular in shape, its anterior margin bearing a flattened rather narrow, elongate process, directed infero-posteriorly, and armed with two slender acute horns or strong spines at its extremity (giving it much the aspect of the forcipated abdominal extremity of a *Forficula*).

The females present as much variation in marking as the males, and in two examples their ground-colour is as bright. In a still united pair, captured *in coitu* at Humbe by Mr. Eriksson, I found the male to be a very well-developed and fully-marked individual, while the female was the smallest taken, wanted all the black spots in the hind wings and had only five very minute ones in the left fore wing, while the right fore wing was aborted, consisting only of a thickened stump. In this female alone was the peculiar abdominal appendage wholly wanting, but in four others it was more or less broken or distorted.

The chief distinguishing characters of *A. asema* are emphasized by italics in the above description, and it is interesting to find that two of the most unusual of them, viz. the subapical portion of the submarginal series of spots in the fore wings and the apical yellowish-white spots which occur on the underside of the fore wings whenever the dark edging is sufficiently widened to contain them, are features that recur in the very different-looking, heavily black-marked *A. violarum*, Boisd. From the somewhat similar *A. doubledayi*, Guér., it is easy to separate *A. asema* by its more opaque wings and their peculiar ochre-yellow tint, by its very small spots, and by the two characters just referred to as recurring in *A. violarum*, as well as by the entire absence of any internervular red marking on the underside of the hind wings; while the female is still further distinguished by the total absence of a subapical white bar in the fore wings.

Mr. Hewitson's specimens were sent by Messrs. Thelwall and Simons from Lake Nyassa, where the species is stated to be rare.

10. ACRÆA AMBIGUA, n. sp. (Plate IX. fig. 11 ♀.)

Nearly allied to *A. acrita*, Hewits.

Exp. al. (♂) 2 in. 4–5 lin.; (♀) 1 in. 10 lin.

♂. *Deep brick-red, with black spots; fore wing with a broad black apical patch (as in* A. caldarena) *immediately preceded by a white space. Fore wing*: four black spots as in *A. acrita*, viz., one in outer half of discoidal cell, and an oblique row of three from extremity of cell towards posterior angle; subbasal spot below median nervure wanting; ground-colour in subapical area, immediately before and below white space, paling into ochreous-yellow. *Hind wing*: cellular, subbasal, and discal spots as in *A. acrita*, but much smaller, those close to base and inner margin obsolescent, and one spot of discal series (between 2nd and 3rd median nervules near their origin) wanting entirely; hind-marginal black greatly narrowed, and reduced to two black lines (the inner one strongly festooned) enclosing seven spots of the ground-colour which are much more elongate than in *A. acrita*. *Cilia* white. UNDERSIDE.—Hind wing and apical area of fore wing yellowish creamy, but duller than in *A. acrita*; *and the former with little or no trace of internervular red markings except near base between* 1*st median nervule and inner margin, while the latter bears a white space fainter than on upperside. Fore wing*: ground-colour redder than in *A. acrita*. *Hind wing*: spots more conspicuous than on upperside, none being obsolescent, arranged as in *acrita*, but all smaller; hind-marginal border as in *A. acrita*, but much narrower.

♀. Like male; but ground-colour slightly duller, black spots proportionally larger and rounder (especially in hind wing); white subapical space in fore wing larger and clearer (extending downward to 2nd median nervule), and bases with a moderate fuscous suffusion. *Hind wing*: hind-marginal border rather wider than in male, its black bounding lines somewhat thicker. UNDERSIDE.—White space in fore wing better expressed; and internervular red markings in hind wing as in *A. acrita*, though much fainter.

Ehanda (September) and Okavango River (December). One male and one female specimen.

I referred to this *Acræa*, as a near ally of *A. acrita*, in 'South-African Butterflies' (vol. iii. p. 382, note); and notwithstanding the wide disparity of aspect effected by the broad apical black patch and adjacent white space in the fore wings, the Butterfly stands so near the species named that I am doubtful whether it can be kept separate when more examples are forthcoming. Besides the two specimens taken by Mr. Eriksson, I have received a fine male captured by Mr. F. C. Selous, in 1889, at a point a little S. of the junction of the Chobe and Zambesi rivers; this agrees well with Mr. Eriksson's Ehanda male, but has the black markings rather stronger. The solitary female from the Okavango is probably a dwarfed example, but in colouring it is much brighter than any female of *A. acrita* that I have seen.

The intimate relationship between this form and *A. acrita* is further shown by a male *Acræa* from Victoria Nyanza in the British Museum, which, although without any white space in the fore wings, presents in most of its markings an approach to the peculiarities of *A. ambigua*.

The antennæ in this *Acræa* and in *A. acrita* are remarkable for their length, which is half that of the fore wings, and for their elongate and gradual (instead of abrupt) elevation.

11. ACRÆA STENOBEA, Wallengr.

Acræa stenobea, Wallengr. Wien. ent. Monatsch. 1860, p. 35. n. 9; Trimen, S.-Afr. Butt. i. p. 153. n. 44 [♂ ♀], pl. 3. f. 2 [♂] (1887).

Ehanda (August and September), Humbe (October), Otiembora (November and December), Okavango River (December), Omaramba-Oamatako (January). Six male and six female examples (four males and two females belonging to the var. *lygus*, Druce).

The male specimens are more warmly tinted above than the more southern examples, and this is especially the case in two (from Otiembora and Humbe respectively) of the var. *lygus*, where the hind wing and the inner-marginal border of the fore wings were (in July 1888) of an exquisite pink with a slight primrose bloom or gloss. The variety was also met with at Ehanda.

In two males of the variety (and also in a typical male from Bechuana-land) two additional black spots, corresponding with those usually possessed by the allied *A. natalica*, Boisd., occur near the hind margin between the second median nervule and the submedian nervure; the lower of these two spots is faintly represented in two females of the variety. In one of the typical males from Otiembara an aberration in marking occurs in both fore wings, on both upper and under sides, in the shape of a straight longitudinal blackish streak uniting lower part of terminal discocellular spot with the 4th spot of the subapical macular bar[1].

In three females of the typical form the white abdominal spots of the posterior segments are so enlarged as to be coalescent, making the posterior half of the abdomen as white as in the male.

12. Acræa acara, Hewits.

♂. *Acræa acara,* Hewits. Exot. Butt. iii. pl. viii. ff. 19, 20 (1865).

Ehanda (August–September). One female specimen.

This solitary example is an aberration, presenting in the fore wings a wide suffusion of black, which includes the subapical black bar, the whole of the discoidal cell (except a small space between the basal and middle cellular black spots), and the costal border to the base; the basal area below the cell is also fuscous as far as the origin of the first median nervule, and the two inferior discal black spots are enlarged and somewhat diffused. The hind wings are more rufous than usual, and without dorsal white clouding; their basal markings are remarkably distinct, and the hind-marginal black border is well defined and completely encloses the series of ochreous spots. On the underside the same peculiarities prevail in the fore wings, where also the subbasal black spots below the median nervure are much enlarged; while the ground of the hind wings is almost wholly pinkish red, with very little white scaling on the disk.

13. Acræa encedon (Linn.).

Papilio encedon, Linn. Mus. Lud. Ulr. Reg. p. 244. n. 63 (1764).

Humbe (October). Six male and one female examples.

These specimens are all of the typical dull-rufous form, none exhibiting any tendency to the pale colouring of the var. *lycia,* Fabr.

[1] *Vide infra*, p. 73, for an exactly corresponding instance in *A. rahira.*

14. Acræa rahira, Boisd.

Acræa rahira, Boisd. Faune Ent. de Madag. etc. p. 33, pl. 5. ff. 4, 5 (1833); Mabille, in Grandid. Hist. Nat. etc. Madag., Lép. i. p. 110, and ii. pl. 11. ff. 9, 10 [♀] (1885–87).

Ehanda (September), Otiembora (November), and Okavango River (December). Four male and two female specimens.

The males are all much paler than the typical more southern examples, especially the two from Ehanda, which are pale ochre-yellow without any rufous tint except near the hind margins on the upperside; and all four possess on the upperside of the fore wings a narrow almost whitish space immediately beyond the subapical transverse series of black spots. In one of the Ehanda males the black spots generally are well developed; but in the other, and in two from the Okavango, they are much smaller than usual; in the first-named example the inner discocellular spot of the fore wings is sharply crescentic instead of roughly ovate. On the underside all the males show the black markings smaller and fainter, especially the transverse streak on the lower disk of the hind wings.

The two females are also considerably paler than the more southern ones, but their spots are not smaller. The yellower of the two has a black streak between the terminal discocellular spot and the third spot of the macular subapical bar[1]. I have noted (South-African Butterflies, i. p. 167) a Kaffrarian female in which the same character occurs, accompanied by other aberrant markings in the fore wings[2].

The doubt expressed by the original describer of this species as to its actual occurrence in Madagascar has not yet been satisfactorily disposed of. Mabille (*loc. cit.*) observes that collections received from Madagascar "ne la contiennent presque jamais," but that it has been taken "dans ces derniers temps" near Tamatave and in the north-east of the island. He gives, however, no authority for either habitat, nor is any authenticated locality stated for the two assumed Madagascar examples in his own possession, or for those noted as having been seen in various collections. In South Africa *A. rahira* is a singularly abundant species (even among its gregarious congeners) wherever it occurs, and is also one of the slowest and most low-flying, and if it really inhabits Madagascar its great rarity there is rather difficult to account for. The female figured by Mabille is in tint and markings nearer to Mr. Eriksson's examples than to those inhabiting the Cape, Natal, and Transvaal.

[1] *Vide supra*, p. 72, for an exactly corresponding marking in a male *Acræa stenobea*.

[2] A far more aberrant female example was taken by Mr. F. C. Selous on the Shashani River in Matabele-land in 1882. All the black spots on both surfaces are in this specimen greatly enlarged and elongated, but *especially those of the hind wings* (which are normally as small), the basal ones more particularly being immensely larger and confluent.

15. Acræa buxtoni, Butl.

Acræa buxtoni, Butl. Ann. & Mag. Nat. Hist. (4) xvi. p. 395 (1875).

Acræa (Telchinia) perrupta, Butl. op. cit. (5) xii. p. 102 (1883).

Omrora (August), Ehanda (September), Omaramba-Oamatako (January). Six male and one female specimens.

In the males there is much variation in the development and distinctness of the fulvous-ochreous spots in the dark hind-marginal border, ranging from even completeness throughout to obsolescence in the fore wings and partial obsolescence in the hind wings. The abbreviated subapical dark marking of the fore wings also varies considerably, and in two males and the only female is reduced to an irregularly subcrescentic moderate-sized spot. Of these latter one male and the female evidently represent the *A. perrupta* of Butler, founded on specimens from Lake Nyanza.

Subfamily Nymphalinæ.

Genus Pyrameis, Doubl.

16. Pyrameis cardui (Linn.).

Ehanda (September) and Omaramba-Oamatako (January). Two examples.

Genus Junonia, Doubl.

17. Junonia cebrene, Trim.

Junonia cebrene, Trim. Trans. Ent. Soc. Lond. 1870, p. 353.

Omrora (August), Ehanda (August–September), and Omaramba-Oamatako (January). Four examples; three males, one female.

18. Junonia clelia (Cram.).

Papilio clelia, Cram. Pap. Exot. i. t. xxi. ff. E, F (1775).

Omrora (August), Ehanda (August–September), Omaramba-Oamatako (January). Thirteen examples; eleven males, two females.

19. Junonia boöpis, Trim.

Junonia boöpis, Trim. Trans. Ent. Soc. Lond. 1879, p. 331.

Omrora (August) and Ehanda (August–September). Four examples; one male, three females.

Genus Precis, Doubl.

20. Precis cuama (Hewits.).

Junonia cuama, Hewits. Exot. Butt. iii. p. 25, pl. 13. ff. 4, 5 [♂] (1864).

Ehanda (August–September) and Okavango River (December). Five examples; three males, two females.

All these specimens, as well as another female from the Zambesi and two males from Mashuna-land in the South-African Museum, are of a much yellower and less rufous tint than the figure of the type, and all want (on both surfaces) the conspicuous white centre of the second and third fuscous spots in the discal row of the fore wings [1], and (on the upperside) the paler cloud in the middle of the hind wings. In the females the dark underside markings are (with the exception of the common median streak) obsolescent [2].

In the Hewitson Collection specimens are recorded also from Lake Nyassa.

21. PRECIS OCTAVIA (Cram.).

Papilio octavia, Cram. Pap. Exot. ii. t. cxxxv. ff. B, C (1777).

Otiembora (November–December) and Okavango River (December). Two examples; male and female.

These specimens are of the southern form (which is larger and brighter in colour than the West-African type-form), and the male, though smaller than usual, is of unusual depth and richness of hue, especially on the underside.

22. PRECIS SESAMUS, Trim.

Precis sesamus, Trim. Trans. Ent. Soc. Lond. 1883, p. 347; S.-Afr. Butt. i. p. 231, pl. 4. f. 3 (1887).

Ehanda (August–September) and Omrora (November). Two male examples.

Both are much broken; they are smaller than usual, and the Omrora specimen exhibits alliance with *P. amestris* (Drury) in the discal red band, which is more sinuate and macular on the upperside and better indicated on the underside than in ordinary *P. sesamus*.

23. PRECIS PELASGIS (Godart).

Vanessa pelasgis, Godt. Enc. Méth. ix. Suppl. p. 820. n. 38,39 (1819).

Okavango River (December). One male example.

The only specimen is rather small, but richly coloured. On the upperside the common pale ochreous discal band is rather narrower, and the discocellular reddish and bluish striæ are better developed than usual. On the underside the band is not so white, more creamy; and the position of the upper part of the discocellular reddish stria of the upperside is indicated by a small but rather conspicuous violaceous-white mark.

24. PRECIS ARTAXIA (Hewits.).

Junonia artaxia, Hewits. Exot. Butt. iii. p. 26, pl. 13. f. 6 (1864).

Ehanda (August–September). One male example.

[1] In a female from Mashuna-land, however, these white centres are well-marked.

[2] *Precis petersii*, Dewitz (K. Leop.-Carol. Deutsch. Akad. Naturf. xli. p. 192, t. xxv. f. 14, 1879), founded on a single specimen collected by Pogge in Angola (lat. 10° S.), is almost certainly a slight variety of *P. cuama*, in which the dusky basal markings of the upperside are rather more developed, and the discal band of the underside is conspicuously paler.

This individual is smaller than the type, expanding only 2 in. 5½ lin. The ocellus on the superior half of the disk in the hind wings is relatively smaller, and there is a similar ocellus (only half the diameter of other) on the lower part of the disk between the first and second median nervules; also in the fore wings there is a less conspicuous but quite similar small discal ocellus between the first and second median nervules. These additional ocelli occur also, though less distinctly, in a larger example from Chaponga on the Zambesi, and the fore-wing ocellus faintly appears in another from Mashuna-land, both taken by Mr. F. C. Selous.

The characters noted approximate to those of the intimately allied *P. nachtigalii*, Dewitz (*l. c.* p. 194, t. xxv. f. 16), described from a single specimen taken by Pogge in Angola (lat. 10° S.); but the underside agrees with that of the typical form, possessing a very well-marked median streak in the hind wings but wanting the three ocelli of the Angolan form.

In the Hewitson Collection specimens of *P. artaxia* are also recorded from Lake Nyassa.

Genus Crenis, Boisd.

25. Crenis natalensis, Boisd., var. (Plate IX. fig. 12 ♂.)

Crenis natalensis, Boisd. App. Voy. Deleg. dans l'Afr. Aust. p. 592. n. 80 (1847).

? *Crenis amazula*, Mab., Grandid. Hist. Phys. etc. Madag. p. 153, pl. xvii. ff. 9, 10 (1885–87).

Omrora (November) and Okavango River (December). Fourteen male examples.

These specimens are all distinguished by a very much paler ochreous-yellow upperside, and a very much paler lilacine-greyish underside of the hind wings and apex of the fore wings, than are found in the male *C. natalensis*; but still more remarkable is the fact that, although very faintly shown, the darker and paler marking of the apical area of the upperside of the fore wings is that proper to the *female* (not to the male) *C. natalensis*. Indeed, these unquestionable males from tropical S.W. Africa look very much like the female *C. amazula* figured by Mabille [1]. They differ, however, in having the basal half of the wings much yellower (almost free from any darker clouding), and the costal-apical dark markings of the fore wing much fainter and less developed; on the underside the latter distinction is also noticeable, but all the small black markings on this surface are more developed (especially the subbasal ones in the hind wings), and the yellow stripes bordering the ocelli of the hind wings are much deeper in colour and more strongly marked. These differences are all of course more marked in com-

[1] M. Mabille himself remarks (*l. c.*) that *C. amazula* may perhaps be only a form of *C. natalensis*. He adds that he had adopted the name (*amazula*) given in Boisduval's collection to a specimen from the "Côte d'Afrique," that the form is rare in Madagascar, and that he had seen only two examples in the Paris Museum.

parison with the much darker female of true *C. natalensis*, with the exception, however, of the underside markings just referred to, which are heavier in the latter than in *C. amazula*, Mabille.

It is not improbable that the discovery of the female may render necessary the separation from *C. natalensis* of the differently and more brightly tinted form brought to notice by Mr. Eriksson.

26. Crenis benguelæ, Chapman.

♂. *Crenis benguelæ*, Chapm. Ent. M. Mag. viii. p. 175 (1872).

♂ ♀. *C. benguelæ*, Dewitz, Nov. Act. Leop.-Carol. Deutsch. Akad. Naturf. xli. p. 179, pl. xxv. ff. 1, 2 (1879).

Ehanda (August–September) and Otiembora (November–December). Six male examples.

The specimens of this striking *Crenis* are considerably larger than Dewitz's figure of a male from Chinchoxo, expanding 2 in. 5½ to 7 lin.; and the black markings of the upperside are better developed, especially the apical hind-marginal border of the fore wings, which emits rather long nervular rays, and the discal spots of the hind wings, which are four or five in number, instead of two only. In all the specimens (except one from Ehanda) there also appears on the upperside of the fore wings a submarginal series of very small indistinct internervular black spots, corresponding to the series of larger ones on the underside.

27. Crenis rosa, Hewits.

♀. *Crenis rosa*, Hewits. Ent. M. Mag. xiv. p. 82 (1877); Trimen, S.-Afr. Butt. i. p. 255 (1887).

♂. *Crenis pechuelii*, Dewitz, l. c. p. 195, pl. xxvi. f. 1 (1879).

♂. *Crenis rosa*, Trim. l. c. iii. p. 403 (1889).

Otiembora (November–December). Eleven male examples.

I have noticed these specimens in the third volume of my 'South-African Butterflies' above quoted, and pointed out the characters distinguishing the male from the female type of the species. Unlike its near congener, *C. benguelæ*, this most beautiful *Crenis* is recorded from a very wide range in Africa, including Lake Nyanza and Delagoa Bay.

In the male the tint of the upperside varies, some specimens being bluer and others pinker in tinge, and the black markings vary a little in size and distinctness. On the underside there is considerable variation in the width of all the shining greenish-white markings of the hind wings.

28. Crenis concordia (Hopff.).

♀. *Harma concordia*, Hopff. Monatsb. k. Akad. Wissensch. Berl. 1855, p. 641; Peters, Reise Mossamb., Ins. p. 391, t. xxii. ff. 3, 4 (1862).

Omrora (1st–10th August). One female example.

It is remarkable to find this apparently very rare species, founded on a single female specimen from Querimba, occurring some 4° further S. on the opposite side of the continent.

Mr. Eriksson's specimen differs from that described and figured by Hopffer in several particulars, but is unfortunately worn and with the hind wings injured about the anal angle. On the upperside all the black spots are reduced in size; in the fore wings the fuscous hind-marginal border is almost wanting, and the subapical oblique costal ray is narrower and whiter; and in the hind wings there is no ochre-yellow colouring immediately beyond the median series of spots, but an additional small black spot occurs just beyond extremity of the discoidal cell. The underside is of a much deeper ochre-yellow, which in the hind wing to beyond middle is much more restricted, while in the fore wing the costal-apical area is streaked by internervular longitudinal bluish-white rays; and on the disk of the fore wings, between the third and a point a little below the first median nervules, there is a conspicuous fuscous cloud, almost obliterating the lowest two spots of the submarginal series, and emitting nervular rays towards base.

It is difficult to understand how Hopffer could have referred this butterfly to the genus *Harma*, as it is a true *Crenis* (not distantly allied to *C. rosa*), but singular in its possession of a common median row of black spots, and on the upperside of the fore wings also black discocellular striæ like those in the genus *Argynnis*. Hopffer himself notices the resemblance in size and form of the wings to the female *Argynnis laodice*, and the likeness extends also to the black markings of the upperside generally.

Genus Hypanis, Boisd.

29. Hypanis ilithyia (Drury).

♂. *Papilio ilithyia*, Drury, Illustr. Nat. Hist. ii. pl. xvii. ff. 1, 2 (1773).

Var. *Hypanis acheloïa*, Wallengr. K. Svensk. Vet.-Akad. Handl., Lep. Rhop. Caffr. p. 29. n. 2 (1857).

Omrora (August), Ehanda (September), Okavango River (December), and Omaramba-Oamatako (January). Fifteen examples: four males and one female of the typical form; eight males and two females of the var. *acheloïa*.

Both the typical form and the variety were taken on the River Okavango and Omaramba-Oamatako, and the variety also at Omrora and Ehanda. Both varied from the medium to the light coloration of the underside, only one example (a male of the variety from Omrora) exhibiting the deep-ferruginous colouring often found in this species.

Genus Neptis, Fabr.

30. Neptis agatha (Cram.).

Papilio agatha, Cram. Pap. Exot. iv. t. cccxxvii. ff. A, B (1780).

Omrora (August) and Ehanda (August–September). Eleven male examples.

Compared with examples of *N. agatha* from Natal, these specimens have the ground of a less deep black; the white bands are slightly narrower, and their external black nervular indentations are very much shorter; and from two to four of the minute white spots near the costa of the fore wings, immediately preceding the white band, are found on the upper as well as on the underside. A dwarfed specimen from Ehanda expands only 1 in. 8½ lin.

Genus Pseudacræa, Westw.

31. Pseudacræa poggei (Dewitz).

♂. *Hypolymnas poggei*, Dewitz, Nov. Act. K. Leop.-Carol. Deutsch. Akad. Naturf. xli. p. 197, pl. xxvi. fig. 2 (1879).

Omrora (August). One male example.

This specimen agrees very nearly with Dewitz's figure of one of the two males stated to have been taken by Pogge in Central Angola, except that in the fore wings the subapical white bar is considerably narrower, and the greyish-white clouding of the apex on the underside is much more conspicuous. The thorax and abdomen are very imperfectly shown in the figure, the former being robust and (like the head) very conspicuously white-spotted, and the latter, though very slender, bearing on each side six conspicuous spots, of which the first two are white and the rest ochreous-yellow.

This most interesting butterfly is a very exact mimicker of *Danais chrysippus*; and it is especially noteworthy that in size (2 in. 10 lin. *exp. al.*) it corresponds with the smaller than usual *D. chrysippus* from the same locality. In three features it is even a closer imitator of its model than the female *Diadema misippus*, viz.: on the upperside of the fore wings the much narrower costal black and the absence of the apical white spot, and on the upperside of the hind wings the narrower, less diffuse, inwardly more sharply dentate hind-marginal black border. On the other hand, the greyish-white clouding on the underside of the apex of the fore wings and the conspicuous spotting of the abdomen are points which lessen *D. poggei's* likeness to *D. chrysippus* as compared to the colouring of the corresponding parts in *D. misippus*. These two characters and the subbasal black spots on the underside of the hind wings are retained generic features of *Pseudacræa*, quite peculiar and unmistakable, and should, in conjunction with that of the very long and gradually clavate antennæ, have prevented the error of the describer of this butterfly in referring it to the genus *Hypolimnas* (=*Diadema*, auct.).

P. poggei is very distinct from every other described species of *Pseudacræa*. In the want of subbasal black spots on the fore wings it agrees with the *P. lucretia* group; but the abdominal spotting is like that of *P. boisduvalii* and *P. trimenii*. The rufous-ochreous ground-colour of the wings exactly accords with that of *Danais chrysippus*, and the paler tint of the hind wings is most perfectly reproduced; while on the underside the creamy ochre-yellow ground and the white neuration and black border of the hind wings (with also a general resemblance in the few white-edged black spots) are precisely simulative of the *Danais*.

Genus Hamanumida, Hübn.

32. Hamanumida dædalus (Fabr.).

Papilio dædalus, Fabr. Syst. Ent. p. 482. n. 174 (1775).
Papilio meleagris, Cram. Pap. Exot. i. t. lxvi. ff. A, B (1775).

Omrora (August). Six male and two female examples.

All the specimens are of the typical (*dædalus*) form, having the underside very dull argillaceous-ochreous more or less tinged with rufous, without white spots (except the two lowest in the discal series of the fore wings, which are tolerably well marked), and with the dark markings very faint.

Genus Charaxes, Ochs.

33. Charaxes candiope (Godt.).

Nymphalis candiope, Godt. Enc. Méth. ix. p. 353. n. 10 (1819).
Charaxes candiope, Trim. S.-Afr. Butt. i. p. 327. n. 107, pl. 6. f. 4 (♂) (1887).

Omrora (August and September) and Ehanda (September). Four male examples.

34. Charaxes saturnus, Butl.

Charaxes saturnus, Butl. Proc. Zool. Soc. 1865, p. 624, pl. 36. f. 1.

Omrora (August), Ehanda (September), and Okavango River (December). Eleven male examples.

35. Charaxes achæmenes, Feld.

Charaxes achæmenes, Feld. Reise Novara, Lep. iii. p. 446, pl. lix. ff. 6, 7 (♂) (1867).

Omrora (August) and Ehanda (September). Three examples, two males and a female.

In this species the apex of the fore wings is remarkably produced, especially in the female.

36. Charaxes ephyra (Godt.).

Nymphalis ephyra, Godt. Encycl. Méth. ix. p. 355 (1819).

Ehanda (August and September). Two examples, a male and a female.

These examples are smaller than usual, especially the female, expanding only 2 in. 5 lin. The lower spots of the outer discal series of the fore wings in the female do not coalesce with those of the inner series, but are quite apart, indistinct, small, crescentic, and bluish; the basal half of both wings is strongly glossed with a greenish-bronzy metallic lustre [1].

[1] There is strong reason for supposing that *C. etheocles,* Cram. (*nec* Drury), figured on pl. cxix. D, E, in vol. ii. of Pap. Exot., is the female *C. ephyra*; notwithstanding the large size, rather rough execution, and crude colouring of the figures, they certainly seem to be intended to represent the female of this *Charaxes.*

37. Charaxes guderiana (Dewitz).

Nymphalis guderiana, Dewitz, Nov. Act. K. Leop.-Carol. Deutsch. Akad. Naturf. xli. p. 200, t. xxvi. f. 18 (1879).

Omrora (August) and Ehanda (September). Sixteen male examples.

Though so differently marked on the upperside, this species exhibits on the underside very close alliance to *C. ephyra* (Godt.), the chief distinctions consisting in the partial reproduction of the white markings of the upperside, and in the hind wings the better definition of the ferruginous discal lunulate streak, and the presence of some whitish scaling immediately beyond the median irregular bluish-black line. *Exp. al.* 2 in. 5–8 lin.

A single male, sent to me in 1883, was taken by Mr. F. C. Selous on the Gwailo River, South Mashuna-land.

38. Charaxes bohemani, Feld.

♂. *Charaxes bohemani*, Feld. Wien. ent. Monatschr. iii. p. 321, t. 6. f. 3 (1859); Butl. Lep. Exot. p. 28, pl. x. f. 3 (♀) (1869).

Omrora (August). Two male examples.

The specimens received of this noble *Charaxes* expand respectively 3 in. $7\frac{1}{2}$ lin. and 4 in. The expanse of the Zambesi female figured by Butler (*loc. cit.*) is given as 3 in. 10 lin. Felder's type was from Lake Ngami (*Wahlberg*); Druce (Proc. Zool. Soc. 1875, p. 412) notes a fine series of the species from Angola (*Monteiro*); and Dewitz (*loc. cit.*) also mentions it as taken in Angola by Pogge.

Family Lycænidæ.

Genus Lycæna, Fabr.

39. Lycæna osiris, Hopff.

♂. *Lycæna osiris*, Hopff. Monatsb. Preuss. Akad. Wissensch. 1855, p. 642. n. 21; Peters, Reise Mossamb., Ins. p. 409, t. xxvi. ff. 11, 12 (1862).

Otiembora (November–December). One female example.

40. Lycæna asopus, Hopff.

♂ ♀. *Lycæna asopus*, Hopff. loc. cit. n. 22 (1855); and op. cit. p. 410, ff. 13–15 (1862)

Omrora (August–September). One male example.

41. Lycæna parsimon (Fabr.).

♂. *Papilio parsimon*, Fabr. Syst. Ent. p. 526. n. 349 (1775).
Papilio celæus, Cram. Pap. Exot. iv. t. ccclxxix. ff. K, K (1781).

Okavango River (December). One male specimen.

42. Lycæna glauca, Trim.

♂ ♀. *Lycæna glauca*, Trim. S.-Afr. Butt. ii. p. 21. n. 123 (1887).

43. Lycæna cissus (Godt.).

♂ ♀. *Polyommatus cissus*, Godt. Encycl. Méth. ix. p. 683. n. 210 (1819).

Otiembora (November–December). One female example.

44. Lycæna jobates, Hopff.

♂. *Lycæna jobates*, Hopff. loc. cit. 1855, p. 642. n. 20; and op. cit. Ins. p. 408, t. xxvi. ff. 9, 10 (1862).

Ehanda (September). One female.

45. Lycæna mahallokoæna, Wallengr.

♂ ♀. *Lycæna mahallokoæna*, Wallengr. K. Sv. Vet.-Akad. Handl. 1857, Lep. Rhop. Caffr. p. 41. n. 16.

Omrora (August). One male example.

46. Lycæna lysimon (Hübn.).

♂. *Papilio lysimon*, Hübn. Samml. europ. Schmett. ff. 534, 535 (? 1798).

Omrora (August). Two male examples.

47. Lycæna lucida, Trim.

♂ ♀. *Lycæna lucida*, Trim. Trans. Ent. Soc. Lond. 1883, p. 348.

Omrora (August) and Ehanda (September). Two male examples.

48. Lycæna gaika, Trim.

♂. *Lycæna gaika*, Trim. Trans. Ent. Soc. Lond. 3rd ser. i. p. 403 (1862); and (♂ ♀) Rhop. Afr. Austr. ii. p. 256. n. 158, pl. 4. f. 7 [♂] (1866).

Omaramba-Oamarako (January). One female example.

49. Lycæna bœtica (Linn.).

Ehanda (September) and Okavango River (December). Five male examples.

50. Lycæna sichela, Wallengr.

♂. *Lycæna sichela*, Wallengr. loc. cit. 1857, p. 37. n. 4.

Omrora (August) and Ehanda (August–September). Twelve male examples.

These are the first specimens of this curious *Lycæna* that I have seen from any locality within the tropical limit. Like the more southern examples, they vary much in size.

51. Lycæna telicanus (Lang).

Papilio telecanus, Lang, "Verz. sein. Schmett. ii. p. 47. n. 387–389 (1789)."

Omrora (August and November) and Ehanda (August–September). Twenty-two male examples.

52. Lycæna jesous (Guérin).

♂. *Polyommatus jesous*, Guér., Lefebv. Voy. Abyss. vi. p. 383, pl. 11. ff. 3, 4 (1847).

Ehanda (September), Humbe (October), and Omaramba-Oamatako (January). Seven specimens; six males, one female.

53. Lycæna moriqua, Wallengr.

♂. *Lycæna moriqua*, Wallengr. loc. cit. p. 39 (1857); ♂ ♀, Trim. S.-Afr. Butt. ii. p. 75. n. 157, pl. 8. ff. 5, 5 *a* (1887).

Ehanda (August–September). Two male examples.

54. Lycæna calice, Hopff.

Lycæna calice, Hopff. loc. cit. 1855, p. 642. n. 18; and op. cit. p. 405, t. xxvi. ff. 4, 5 (1862).

Omrora (August) and Ehanda (August–September). Three examples; a male and two females.

These specimens of *L. calice* are rather larger than the type figured by Hopffer, and have on the upperside the basal and marginal black clouding in both fore and hind wings less strongly developed; while on the underside all the black markings are more attenuated.

55. Lycæna melæna, Trim.

Lycæna melæna, Trim. S.-Afr. Butt. ii. p. 82. n. 161 (1887).

Omrora (August), Ehanda (August–September), and Okavango River (December). Six examples; four males, two females.

All these specimens are rather smaller than usual, their upperside is typical in character, but the underside markings (as in the closely allied *L. calice*) are more attenuated.

56. Lycæna sybaris, Hopff.

♂ ♀. *Lycæna sybaris*, Hopff. Monatsb. Preuss. Akad. Wissensch. 1855, p. 642; and op. cit. p. 408, t. xxvi. ff. 6–8 (1862).

Omrora (August), Ehanda (September), Otiembora (November–December). Six examples; five males, one female.

Genus Lycænesthes, Moore.

57. Lycænesthes amarah (Guérin).

♀. *Polyommatus amarah*, Guér., Lefebv. Voy. Abyss. vi. p. 384, pl. 11. ff. 5, 6 (1847).

Omaramba-Oamatako (January). One male example.

58. Lycænesthes otacilia, Trim.

♂. *Lycænesthes otacilia*, Trim. Trans. Ent. Soc. Lond. 1868, p. 90; and S.-Afr. Butt. ii. p. 102. n. 171, pl. 7. f. 8 (1887).

Ehanda (September). One female example.

Genus Deudorix, Hewits.

59. Deudorix antalus (Hopff.).

Dipsas antalus, Hopff. loc. cit. 1855, p. 641. n. 15; and op. cit. p. 400, t. xxv. ff. 7–9 [♀] (1862).

Omrora (August). One female example.

60. Deudorix licinia (Mabille).

♂. *Thecla licinia*, Mab. Bull. Soc. Zool. France, 1878, p. 83; Grandid. Hist. Phys. etc. Madag. pl. 30 A. ff. 5, 5*a* (1885).

♂ ♀. *Deudorix dinochares*, H. G. Smith, Ann. & Mag. Nat. Hist. 5th ser. xix. p. 64. n. 7 (1887).

Omrora (August), Ehanda (August–September), and Okavango River (December). Four male examples.

The Okavango specimen and one of the two Ehanda examples are normal and full-sized, but the other two are considerably smaller, and the Omrora individual has the orange-red ground-colour yellower in tint than usual, and the fuscous border of the fore wings narrower.

61. Deudorix obscurata, n. sp. (Plate IX. fig. 13 ♂.)

Exp. al. 1 in. 2 lin.

♂. *Glossy lilacine-blue, with costa of both wings and apical half of fore wing pale dull brownish grey; in fore wing, between costa and 1st median nervule, a very large upper-median black patch.* *Fore wing*: inner margin prominently convex before middle; black patch irrorated with blue in discoidal cell and between 1st and 2nd median nervules; costal border of brownish grey very narrow as far as outer edge of black patch; very broad apical hind-marginal brownish grey, abruptly terminating on 1st median nervule. *Hind wing*: costal subbasal sexual badge large, shining, whitish, fuscous-edged, roughly ovate; costal border of brownish grey moderately wide as far as apex, not extending below 2nd subcostal nervule; inner-marginal brownish-grey border suffused with whitish, not extending above submedian nervure; a fine black hind-marginal bounding line, more apparent inferiorly; linear black tail at extremity of 1st median nervule white-tipped, rather long; lobe at anal angle not large, bearing a black spot with some metallic-blue scales. *Cilia* brownish grey, mixed slightly with white near posterior angle of fore wing and in hind wing, in which latter white predominates at and near anal angle. Underside.—Pale yellowish grey; ordinary terminal discocellular, discal, and submarginal markings not darker than the ground-colour, but defined by very slender and inconspicuous whitish bounding lines; no subbasal spots in either wing. *Fore wing*: just below median nervure and origin of its 1st nervule a conspicuous longitudinal black mark (mostly hidden by convex prominence of costa of hind wing), being the upper part of a large shining whitish black-edged subpyriform inner-marginal sexual badge, corresponding with that on costa of hind wing on the upperside. *Hind wing*: black spot on anal-angular lobe and a similar very conspicuous hind-marginal black spot between 1st and 2nd median nervules bounded internally by a wide pale-yellow lunule; costa rather prominently convex at a little distance from the base.

Omrora (November). One male example.

This species belongs to the group separated generically by Moore (Lep. Ceylon, i. p. 104, 1881) as *Virachola*, and in its blue upperside colouring resembles the much larger *D. perse*, Hewits., which is given as the typical species. In the strong convexity or lobation of the wing-margins where they overlap near the bases, *D. obscurata* resembles *Hypolycæna cæculus* (Hopff.), while in the very conspicuous black patch or cloud on the upperside of the fore wings it bears some likeness to *H. erylus* (Godt.).

Genus Hypolycæna, Feld.

62. Hypolycæna cæculus (Hopff.). (Plate IX. fig. 14 ♂.)

Iolaus cæculus, Hopff. Monatsb. k. Akad. Wissensch. Berl. 1855, p. 642. n. 17; and Peters, Reise Mossamb., Ins. p. 402, t. xxv. ff. 12–14 (♂ ♀).

Omrora (August). Eight examples; six males and two females.

The examples under notice are rather larger (*exp. al.* ♂ 1 in. 3–5½ lin., ♀ 1 in. 4½–5½ lin.) than the types from Querimba and Tette described and figured by Hopffer, and also than the specimens I have received from Delagoa Bay. The males further differ on the upperside in presenting a decidedly more violaceous tint than the East-African males, and a narrower fuscous apical hind-marginal border in the fore wings; while both sexes on the underside have the thin transverse streaks of a much more decided red.

Besides the above-mentioned examples the collection contains six males (four from Humbe taken in October, and two from Omrora taken in November) which appear to constitute a very strongly marked *seasonal form* of *H. cæculus*, presenting the following distinctions from the earlier brood:—*Size larger* (exp. al. 1 in. 5–6 lin.); upperside of a *deeper violaceous not inclining to blue*, with the fuscous border of fore wings broader; underside with the *red transverse streaks greatly* (*from more than twice to three times*) *broader*. The underside markings correspond so exactly in position and form with those of ordinary *cæculus* that, notwithstanding their extreme development, it is impossible to regard them as indicating a distinct species.

Genus Iolaus, Hübn.

63. Iolaus bowkeri, Trim.

♀. *Iolaus bowkeri*, Trim. Trans. Ent. Soc. Lond. 3rd ser. ii. p. 176 (1864); Rhop. Afr. Aust. ii. p. 225. n. 130, pl. 4. f. 4 (1866); and (♂ ♀) S.-Afr. Butt. ii. p. 132. n. 186 (1887).

Ehanda (September), Omrora (November), Okavango River (December), and Omaramba-Oamatako (January). Five examples; three males, two females.

A female from the Okavango River is the largest I have yet measured, expanding 1 in. 7 lin. The species is widely distributed over extra-tropical South Africa, and is also recorded from Kinsembo, a little to the N. of Ambriz in Angola.

64. Iolaus pallene (Wallengr.).

Myrina pallene, Wallengr. K. Sv. Vet.-Akad. Handl. 1857, Lep. Rhop. Caffr. p. 36.

Okavango River (December). One male example.

This species, so isolated in colour and marking, seems to be remarkably rare, although known to occur at widely-remote spots, such as Lakes Nyanza and Nyassa in tropical, and Swaziland and Natal in extra-tropical South Africa. From the latter region of the continent I have seen but one individual, but have been authentically informed of the occurrence of five others.

Genus Aphnæus, Hübn.

65. Aphnæus erikssoni, n. sp. (Plate IX. fig. 15 ♀.)

♀. *Exp. al.* 1 in. 7 lin.

Dull brownish red, with a common terminal hind-marginal fuscous line; cilia short, whitish. Fore wing: just at extremity of discoidal cell a good-sized rather indistinct quadrate ochre-yellow spot; a little beyond it a transverse series of five smaller spots of the same colour, lying between subcostal nervure and first median nervule, of which the third (between lower radial and third median nervules) is nearer hind margin than the rest, and the fifth (lowest) is smallest and most indistinct. *Hind wing*: traces of three very indistinct ochre-yellow spots, one at extremity of discoidal cell, and two (very small) beyond it; anal-angular portion much elongated and produced, with a very prominent broad terminal lobe, fuscous, with bronzy-greenish scales; at extremity of submedian nervure a moderately-long rather stout tail, of the ground-colour. [Tail on 1st median nervule wanting, but probably present in uninjured examples.] Underside.—*Brownish ochre-yellow, with good-sized, rounded, thinly ferruginous-brown-edged ochre-yellow spots*; in both wings, a terminal discocellular spot, and an irregular discal series of contiguous spots, also a series of separate spots along hind margin. *Fore wing*: in discoidal cell two spots, one subbasal, the other median; inner-marginal border dull pale yellowish; six spots in discal series, of which the third (between lower radial and 3rd median nervules) is beyond, and the sixth (imperfect, and below 1st median nervule) before, the rest; seven spots in hind-marginal series. *Hind wing*: a subbasal series of four circular spots, of which the 2nd is in discoidal cell, and the 3rd (between 1st median nervule and submedian nervure) is considerably beyond the rest; nine spots in discal series, of which the 2nd, 3rd, 4th, and 8th are more or less beyond the rest; in hind-marginal series six separate spots, succeeded (below 1st median nervule) by three confluent into one; some metallic-greenish scales on extremity of anal-angular lobe, preceded (below submedian nervure) by a small dull crimson spot.

Head above dull brownish red; eyes banded anteriorly by a metallic silvery-white stripe, posteriorly by a dull white one; palpi with terminal joint and upperside of middle joint brownish red, but beneath dull creamy; antennæ ferruginous, tipped with ochre-yellow, beneath tinged with whitish about middle. Abdomen dull brownish red laterally and terminally, beneath pale dull creamy in basal half.

In its robust body and produced wings, as well as in its five-branched subcostal nervure of the fore wings, this butterfly exhibits unmistakable signs of belonging to the section of *Aphnæus* which includes the brilliant *A. hutchinsonii*, Trim., and (I believe) *A. orcas* (Drury), and which Mr. de Nicéville has recently (Butt. India &c. iii. p. 347, 1890) proposed to separate generically under the name of *Aphnæmorpha*. The almost ferruginous tint of the upperside, and the entire absence of silvery or other metallic lustre in the spots of the underside, impart a most singular aspect to this species, quite unlike that of any previously known member of the genus [1]. The position and arrangement, however, of the dark-edged spots on the underside are similar to those found in *A. orcas*. Unfortunately, the only example contained in Mr. Eriksson's collection is somewhat rubbed and worn.

66. Aphnæus natalensis (Westw.).

♀ (?). *Amblypodia natalensis*, Westw. Gen. D. Lep. ii. p. 479, pl. lxxv. f. 4 (1852).

♂ ♀. *Aphnæus natalensis*, Hewits. Ill. D. Lep. p. 62, pl. 25. ff. 1, 2 (1865).

Omaramba-Oamatako (January). Two examples; male and female.

67. Aphnæus modestus, n. sp. (Plate IX. fig. 16 ♂.)

♂. *Exp. al.* 1 in. 2 lin.

Like *A. natalensis* (Westw.) ♂, but the violaceous gloss of a deeper tint, inclining to purple. *Fore wing*: short ochre-yellow transverse band crossing discoidal cell narrower, median band straighter and inferiorly wider, outer band narrower and united to median one between 1st and 2nd median nervules. *Hind wing*: no hind-marginal pale streak preceding black edging-line; anal-angular ochre-yellow spot smaller, and with only very faint indication of two minute blackish spots on its outer edge. Underside.—*Pale whitish yellow; the transverse fascia almost of the same tint as the ground-colour, thinly edged with fuscous in fore wing and with pale grey in hind wing, and rather sparsely marked with silvery along their middle. Fore wing*: fasciæ and other markings arranged as in *natalensis*, but the former broader, less regular, more sinuate;

[1] Mr. Hewitson in 1875 described (Ent. M. Mag. xii. p. 39), from a single Bornean example, a large *Aphnæus*, under the name of *A. vixinga*, which has a "dark red-brown upperside," but the underside is noted as having "many silver spots" in both wings.

blackish subbasal infracellular marking larger, more as in *A. masilikazi*, Wallengr.; two submarginal streaks pale grey, interrupted on nervules, the inner one commencing with a small costal spot (as in *masilikazi*) and becoming blackish below 2nd median nervule. *Hind wing*: subbasal spots extremely indistinct; the two fasciæ very much more irregular than in either *A. natalensis* or *A. masilikazi*, and in outline and relative position much as in *A. ella*, Hewits., the extremity of the short outer fascia just meeting a projection of the long median one on 3rd median nervule; two submarginal streaks linear, pale grey, broken into lunules, the inner one spangled with silvery along its lower half; a very small anal-angular black spot, and near it (just above submedian nervure) a minute silvery-spangled spot.

Although this form is represented by a rather worn individual only, the characters of the underside are so markedly different from those of any *Aphnæus* known to me that I have no hesitation in noting it as a distinct species. The anal-angular lobe of the hind wings appears to be much less prominent than in the allied species, but this may be partly due to the wing being more worn in that part than elsewhere.

Omrora (November). One male example.

68. Aphnæus victoriæ, Butl.

Aphnæus victoriæ, Butl. Ent. M. Mag. xx. p. 251 (1884).

Omrora (November). One male example.

I have already noticed this specimen in my 'South-African Butterflies' (iii. p. 414, note), pointing out the alliance of the species to *A. masilikazi*, and the singularity of the underside markings which distinguish it. Mr. Butler gives Victoria Nyanza as the *habitat* of the type.

69. Aphnæus phanes, Trim.

♂ ♀. *Aphnæus phanes*, Trim. Trans. Ent. Soc. Lond. 1873, p. 111, pl. i. figs. 4, 5.

Ehanda (September), Okavango River (December), and Omaramba-Oamatako (January). Six examples; two males and four females.

70. Aphnæus homeyeri, Dewitz.

♂ ♀. *Aphnæus homeyeri*, Dew. Deutsch. ent. Zeitschr. xxx. p. 429, pl. ii. figs. 5, 5 *a*, 5 *b*, 5 *c* (1887)[1].

Omrora (August and November), Ehanda (September). Ten examples; seven males and three females.

As Dewitz remarks (*loc. cit.*), there is close agreement on the upperside between this species and *A. natalensis* (Westw.). As regards the underside, however, not only is the ground-colour of a decidedly duller yellow (in some specimens inclining to ochreous or

[1] Dewitz notes that this species was brought from Angola by both Homeyer and Pogge, and that the latter took one specimen at Mukenge on 9th December. (The latter locality is situated in about 6° S. lat. and 22° 30′ W. long., close to the Lulua River.)

arenaceous), but, while the fore-wing markings differ but slightly from those of *natalensis*, in the hind wing both the transverse bands are broken and irregular instead of straight and even, and the outer one, instead of being wholly separate, usually touches and often unites with the inner one, being strongly bent inward between the subcostal nervules. The basi-inner marginal orange of the underside in *natalensis* is wanting in *homeyeri*, but the sub-basal spots in the hind wing are considerably or even greatly enlarged, the two outermost in the latter case often touching the inner transverse band (as in Dewitz's fig. 5 *a*).

It is a remarkable fact that, of the ten examples collected by Mr. Eriksson, the six taken in August and September are without exception of very dull colouring beneath, contrasting strikingly with the bright tints of the four captured in November. In the latter the ground is a clear, or almost clear, pale yellow, and the markings orange-red or ferruginous-red and sharply defined; but in the former both ground and markings are much altered and approximate to each other in hue, especially in the hind wings, where an almost uniform isabelline-sandy tint prevails. This dulness and almost obliteration of the markings, except for their silvery streaks and spots, are most pronounced in the female, and, like several other instances recorded in this paper, appear to indicate a dry-season (winter) generation in which the underside colouring harmonizes with the exposed soil and withered herbage [1].

Genus Chrysorychia, Wallengr.

71. Chrysorychia harpax (Fabr.).

♀. *Papilio harpax*, Fabr. Syst. Ent., App. p. 829. n. 327–328 (1775).

♂. *Chrysorychia tjoane*, Wallengr. K. Sv. Vet.-Akad. Handl. 1857, Lep. Rhop. Caffr. p. 44.

Ehanda (August and September), Okavango River (December), and Omaramba-Oamatako (January). Five examples; three males and two females.

In all these specimens the underside colouring is pale and dull, and its metallic spots small and faint, while the male from Omaramba-Oamatako presents the peculiarity of a rather conspicuous dark-grey submarginal fascia in the hind wings. On the upperside they have the ground-colour of a paler red, and the males have a narrower dark apical border, than more southern examples; and in all respects they resemble the Zambesian and Matabele-land specimens mentioned in my 'South-African Butterflies' (ii. p. 164, note). One of the two Ehanda females agrees very closely with Hopffer's figure (Peters, Reise Mossamb.,Ins. pl. xxvi. f. 2) of a Querimba individual of the same sex.

[1] Mr. de Nicéville (Butt. India &c. iii. pp. 354, 360, 364, 1890) gives evidence tending to show that occasional dimorphism occurs in several Asiatic species of *Aphnæus*.

72. Chrysorychia amanga (Westw.).

♂ ♀. *Zeritis amanga*, Westw., Oates' 'Matabele-land,' &c. p. 351. n. 62 (1881).

Omrora (August and November) and Humbe (October). Ten examples; six males and four females.

These males on the upperside differ from the Transvaal one figured in 'South-African Butterflies' (ii. pl. 9. f. 1) in the much larger red field in the fore wings, extending more or less over the discoidal cell and the upper discal area beyond the cell. Both sexes have the underside of a very uniform reddish-ochreous—a character which I have previously noticed in some of the females only.

Genus Zeritis, Boisd.

73. Zeritis leroma (Wallengr.).

♀. *Arhopala? leroma*, Wallengr. loc. cit. p. 42 (1857).

♂ ♀. *Zeritis leroma*, Trim. Trans. Ent. Soc. Lond. 1870, p. 375, pl. vi. f. 10 [♂].

Otiembora (November to December), Okavango River (December), Omaramba-Oamatako (January).

74. Zeritis aranda (Wallengr.).

♂. *Cygaritis aranda*, Wallengr. loc. cit. 1857, p. 43.

Omrora (August). Three male examples.

On the underside the ground-colour in these specimens is duller and paler than usual, but the sub-metallic spots of the hind wing are whiter and more shining.

75. Zeritis molomo, Trim.

♀. *Zeritis molomo*, Trim. Trans. Ent. Soc. Lond. 1870, p. 373, pl. vi. f. 9; and var. A (♂ ♀), S.-Afr. Butt. ii. p. 206 (1887).

Humbe (October), Okavango River (December), and Omaramba-Oamatako (January). Nine examples; four males and five females.

These specimens approximate more nearly to the var. A above referred to, but are decidedly smaller than usual. The males have the fore wings longer apically, and the anal angular projection and short tail of the hind wings longer; the orange ground-colour is brighter, the dark costal patch is larger in both fore and hind wings, and the dark border of the fore wings is wider at the posterior angle. The females are nearer to the typical form than usual in having the hind-marginal border of the fore wings but slightly pierced by nervular projections of the ground-colour.

76. Zeritis damarensis, n. sp. (Plate IX. fig. 17 ♂.)

♂. *Exp. al.* 1 in. 4–5½ lin.

Closely allied to *Z. molomo*, Trim., but much larger. Orange-yellow paler and duller and in both wings restricted to discal area, *the basal area being widely obscured with ochreous-fuscous.* Underside.—*Costa of fore wing above costal nervure, and base and* *upper median portion of hind wing, conspicuously clouded with whitish. Fore wing*: silvery-white centres to discocellular and discal spots large and bright; lowest spot in discal series large and curved; a small black spot (as in *Z. picrus*, Cram.) immediately below sub-basal discocellular spot. *Hind wing*: sub-metallic spots whiter but not so bright as in *Z. molomo, the outer discal series more remote from the inner one and more regular*; last two spots of both outer discal and hind-marginal series fuscous, outwardly bounded by whitish.

The variability and intimate alliance of the various forms of this (the *Thyra*) section of *Zeritis* render a satisfactory discrimination of them exceedingly difficult, but I think that the difference of size and the peculiarities of marking above noted warrant the separation of *Z. damarensis* as a distinct species. It should be observed that the specimens described were taken at the same place and during the same month as *Z. molomo*.

Omaramba-Oamatako (January). Three male examples.

Genus Erikssonia, n. g.

Imago.—*Head small*, clothed with short down; eyes smooth; antennæ rather short, thick, very gradually incrassate from about middle to tip (which is obtuse); palpi long, horizontally porrect, not convergent but apart throughout their length, laterally compressed, clothed with short scales above and with long densely-packed hair-like scales beneath, terminal joint long, acuminate, but not very slender.

Thorax very short, slender, very sparsely clothed with scales and hairs. *Fore wing elongate*, produced apically; costa but slightly arched at base, and thence almost straight to apex; hind margin slightly convex between upper radial and 3rd median nervules; subcostal neuration like that of *Zeritis, except that the 4th nervule is shorter and terminates on costa just before apex*; discocellular nervules almost vertically transverse, slightly curved, the lower about twice as long as the upper one; *upper radial nervule united to subcostal nervure at some distance beyond extremity of cell*; discoidal cell short, less than half the length of wing. Hind wings with costa very prominently convex at base, but thence only moderately curved; hind margin slightly sinuate (in female and in one of the male specimens with a very slight subangular prominence at extremity of 3rd median nervule); at anal angle a short acute projection; costal nervure terminating at apex; subcostal nervure branching a little before extremity of cell; discoidal cell very short; radial nervule starting from junction of discocellular nervules nearer to 2nd subcostal than to 3rd median nervules. *Legs* rather long and *stout*, thickly clothed with scales; tibiæ very sparsely, tarsi closely spinulose beneath; *middle and hind tibiæ with very short terminal spurs*; fore tibiæ in male armed with a long straight terminal spur outwardly and superiorly; middle and hind tarsi with the first joint longer than tibia (and in male as thick), and with the terminal claws large and strong; fore tarsi longer than tibia, in male more slender than tibia and ending in a long slightly-curved acute claw, in female as thick as tibia and like the other tarsi except that the first joint is shorter.

Abdomen of moderate length, slender, laterally compressed, arched, acuminate.

The structural characters italicized in the above diagnosis are those that mainly distinguish this new genus from *Zeritis*; but the whole aspect, notwithstanding similarity of colouring and to a less extent of marking, is very different from that of the latter genus, and resembles that of the small *Acrææ* represented by *A. serena*, Fabr. Though much more normal as a Lycænid than such aberrant African genera as *Deloneura* and *Lachnocnema*, *Erikssonia* exhibits considerable divergence from the typical groups of the family, and is probably best placed between *Zeritis* and *Mimacræa*, but nearer to the former than to the latter.

77. Eriksonia acræina, n. sp. (Plate IX. figs. 18 ♂, 19 ♀, 20 ♂.)

Exp. al. (♂) 1 in. $1\frac{1}{2}$–$4\frac{1}{2}$ lin.; (♀) 1 in. 6 lin.

♂. *Varying from pale to deep fulvous-ochreous, with narrow fuscous marginal borders. Fore wing*: a moderately broad costal border, commencing before first third of wing, becoming gradually wider to apex, but very deeply excavated by the ground-colour a little before apex; a terminal narrow elongate transverse discocellular fuscous mark joined to costal border (in one of the larger examples almost obsolete); some of the underside markings, consisting of two discocellular dark spots and a discal and a submarginal series of dark spots, indistinctly traceable; hind-marginal border, below apical costal expansion, evenly narrow to posterior angle, its inner edge emitting short nervular dentations; cilia pale ochre-yellow, with two or three rather indistinct dark nervular interruptions along upper half of wing. *Hind wing*: hind-marginal border without internal dentations, narrower than in fore wing, except at apex, where there is a considerable fuscous expansion much like that in fore wing; from the lower inner corner of this expansion there runs (in the two paler smaller examples) a somewhat sinuated, slightly tapering, outwardly denticulated, submarginal fuscous streak, the extremity of which is curved to join that of hind-marginal border at anal angle; in one of the two large examples only the very commencement of this streak is distinct, in the other the whole streak is wanting and the apical dark marking is much reduced. Cilia long, creamy, with regular narrow nervular fuscous interruptions. Underside.—*Paler and duller than upperside, varying (in accordance with tint of upperside) from pale dull ochre-yellow in the two smaller examples to pale fulvous-ochreous in the two larger ones; in both wings—three discocellular black spots (one terminal), an irregular discal row of smaller black spots, a submarginal black streak (submacular in fore wing) bearing along its inner side a submacular glittering-silvery streak, and a hind-marginal well-marked black edging line, immediately preceded by a creamy one (the latter* *less distinct in the smaller, paler specimens*). *Fore wing*: costa edged with creamy in basal fourth, and beyond that by a very slender black line; a small black mark on costal nervure at base; 1st discocellular spot close to base, 2nd about middle of cell; a small extra-cellular spot occurs immediately below the middle cellular spot in both wings of one of the larger examples, and (minutely) in the left wing of the two smaller examples; 6 spots in oblique discal row, of which the 6th (wanting in one of the larger examples) is considerably before and smaller than the rest and situated just below 1st median nervule, while the 4th and 5th are slightly before the upper three. *Hind wing*: ground-colour paler than that of fore wing, *but in the two large examples much clouded with pinkish red*, most developed beyond discal series of spots (in which part there exists a faint tinge of the colour in the smaller examples): 1st discocellular spot at base, 2nd nearer to it than to terminal spot (which is slender and sublunular); three other sub-basal black spots, one immediately above, the others immediately below discoidal cell; discal series consisting of 8 small spots, of which the 1st is considerably the largest, close to costa, and (as well as the 8th, on inner margin) situated far before the rest, and the 6th (between 1st median nervule and submedian nervure) is sublunular, elongate, and a little before the 5th and 7th; neuration between sub-marginal and hind-marginal black streaks more or less defined with black. Cilia as on upperside.

Head fuscous above, creamy, or creamy and fulvous-ochreous, frontally; a white line round the eyes; palpi fuscous above, ochreous-creamy beneath; antennæ fuscous above, creamy-whitish beneath, the tip and the underside of the elongate incrassation chestnut-red. Thorax black above, with fulvous-ochreous collar and creamy-ochreous pterygodes—creamy-ochreous mixed with white beneath. Legs creamy-ochreous throughout. Abdomen above and laterally paler or deeper fulvous-ochreous, beneath paler; an inferior lateral black line, bordered on each side by a series of white marks.

♀. Like ♂. *Fore wing*: upper three spots of discal series of underside well represented and completely united, so as to form a conspicuous, transverse, fuscous streak, about midway between terminal discocellular spot and hind-marginal border; base with a moderate fuscous suffusion; inner edge of hind-marginal border more deeply indenting ground-colour on nervules. *Hind wing*: a moderate basal fuscous suffusion; spots of underside better indicated than in male; apical fuscous and submarginal streak well-developed. Underside.—As in larger males; but silvery-marked submarginal streak broken in fore wing into six quite separate spots, and pinkish-red clouding of *hind wing*, though generally diffused, not so bright, especially just before submarginal streak.

2 ♂ (smaller and paler), Omrora, November.

2 ♂ (larger and brighter), Okavango River, December.

1 ♀, Otiembora, between 20th November and 2nd December.

The amount of variation in so small a number of specimens is very noteworthy, and indicates the unstable condition of a species to all appearances under process of modification in mimicry of the genus *Acræa*. While the fulvous colouring and dark borders unquestionably give this butterfly a strong resemblance to *A. buxtoni*, Butler, as far as the upper surface goes, the spotting and colouring of the under surface present (especially in the hind wings) an unmistakable likeness to those of *A. axina* and *A. atergatis*, Westwood, the mimicry being further strengthened by all the details of colouring in the head, body, and legs. I regard this as a most instructive case of mimicry in progress, because, on both surfaces of the wings, the ordinary coloration and markings of the section of *Zeritis* to which *Z. molomo*, mihi, and *Z. aranda*, Wallengr., belong would appear to have afforded the obvious material on which natural selection has worked to bring about the very decided, though still incomplete, likeness to *Acræa*, the lengthening of the fore wings materially assisting in producing the effect required.

Genus ALÆNA, Boisd.

78. ALÆNA AMAZOULA, Boisd.

Acræa (*Alæna*) *amazoula*, Boisd. App. Voy. de Deleg. dans l'Afr. Aust. p. 591. n. 60 (1847).

Okavango River (December). One female example.

This is the most northern and western station known to me for this species. Other tropical localities for it are Bulawayo in Matabele-land, and Umfula River in Mashuna-land, whence examples have been sent to me by Mr. F. C. Selous.

Family PAPILIONIDÆ.

Subfamily PIERINÆ.

Genus TERIAS, Swains.

79. TERIAS BRIGITTA (Cram.).

♀. *Papillio brigitta*, Cram. Pap. Exot. iv. t. cccxxxi. ff. B, C (1780).

Omrora (August), Ehanda (August–September), Humbe (October), and Okavango River (December). Twenty-two examples; ten males and twelve females.

One of the three males from Ehanda has the underside without any tinge of rufous, and resembling that of the ordinary male *zoë*, Hopff., in tint, but the markings are almost obsolete.

80. TERIAS ZOË, Hopff.

♀. *Terias zoë*, Hopff., Monatsb. Akad. Wissensch. Berl. 1855, p. 640; and Peters, Reise Mossamb., Ins. p. 369, t. xxiii. ff. 10, 11 (1862).

Omrora (August and November), Ehanda (September), Humbe (October), and Omaramba-Oamatako (January). Seven male examples.

81. Terias floricola, Boisd.

Xanthidia floricola, Boisd. Faun. Ent. Madag. etc. p. 21. n. 2 (1833); and (*Terias fl.*) Sp. Gén. Lép. i. p. 671. n. 29 (1836).

Omrora (August and November), Ehanda (September), and Humbe (October). Eight examples; six males and two females.

Mr. Eriksson's specimens all show a difference from more southern examples in having the apical portion of the black border of the fore wings with a more prominent inward projection, so as more to resemble the corresponding markings in *T. butleri*, mihi. Moreover, two of the males taken in the summer at Humbe and Omrora respectively approach *T. butleri* in the absence of the usual underside markings; and another male from Omrora (November) has the same markings only slightly developed.

82. Terias butleri, Trim.

♂ ♀. *Terias butleri,* Trim. S.-Afr. Butt. iii. p. 23. n. 244 (1887).

Omrora (November), Humbe (October), and Okavango River (December). Nine examples; seven males and two females.

83. Terias regularis, Butl.

♂. *Terias regularis,* Butl. Ann. & Mag. Nat. Hist. 4th ser. xviii. p. 486 (1876).

♂ ♀. *Terias regularis,* Trim. op. cit. p. 26. n. 246 (1887).

Ehanda (September). One female example.

It is with some doubt that I refer this specimen to the species named, as on the upperside it has the fore-wing border considerably narrower apically, and the hind-marginal nervular marks reduced (as in *T. desjardinsii,* Boisd., ♀) to dots, while on the underside there is a decided rufous tinge over the margins of the hind wings and the apex of the fore wings and the ordinary markings are obsolescent. Except in its being narrower apically, the fore-wing border agrees with that in the female *T. regularis*; and altogether the specimen is intermediate between this form and the closely-allied *T. desjardinsii.*

Genus Mylothris, Butl.

84. Mylothris agathina (Cram.).

♂. *Papilio agathina,* Cram. Pap. Exot. iii. pl. ccxxxvii. ff. D, E (1779).

Omrora (August) and Humbe (October). Three examples; two males and a female.

The two (♂ and ♀) specimens from Omrora are markedly smaller than usual; but the Humbe example is of full size.

Genus Pieris, Schrank.

85. Pieris mesentina (Cram.).

♂. *Papilio mesentina,* Cram. op. cit. iii. pl. cclxx. ff. A, B (1780).

Ehanda (August–September), Humbe (October), and Omaramba-

Oamatako (January). Nine examples; seven males and two females.

Excepting two from the last-named locality, all these specimens are rather small.

86. PIERIS SEVERINA (Cram.).

♀. *Papilio severina,* Cram. op. cit. iv. pl. cccxxxviii. ff. G, H (1781).

Omrora (August) and Ehanda (August–September). Two male examples.

These two rather small males closely agree with the two from Limpopo River, noted in my 'South-African Butterflies' (iii. p. 70), having the underside of the hind wings clear lemon-yellow with the neuration almost without fuscous clouding.

Genus HERPÆNIA, Butl.

87. HERPÆNIA ERIPHIA (Godt.).

Pieris eriphia, Godt. Encycl. Méth. ix. p. 157. no. 134 (1819).

♂. *Pontia tritogenia,* Klug, Symb. Phys. t. viii. ff. 17, 18 (1829).

Ehanda (August–September), Humbe (October), Okavango River (December), and Omaramba-Oamatako (January). Twenty-four examples; twenty-two males and two females.

The Ehanda specimens (twelve males and a female) all belong to the var. *melanarge,* Butl., in which the hind wings and the apex of the fore wings are on the underside suffused with dull ochry-reddish (in the paler parts with a carneous tinge). All the other specimens, taken in three different localities from October to January, are of the ordinary typical form; and there thus appears some evidence for thinking that the var. *melanarge,* met with only in August and September, will prove to be a form of the species peculiar to the cool or dry season [1]. The underside colouring is probably protective during the parched state of the earth and herbage.

Genus TERACOLUS, Swains.

88. TERACOLUS SUBFASCIATUS, Swains.

Teracolus subfasciatus, Swains. Zool. Illustr. 2nd ser. iii. pl. 115 (1833).

Omrora (August), Ehanda (August–September), and Omaramba-Oamatako (January). Fourteen examples; thirteen males and one female.

These localities show a further range northward for this beautiful species than was previously known, Ehanda being in about 16° S. lat. The four male examples captured in August and September

[1] In Angola rain falls only during the hot season, from the end of October to the beginning or middle of May (see Monteiro, 'Angola and the River Congo,' ii. p. 233); and I am informed that similar climatal conditions prevail in Ovampo-land.

differ from those taken in January in the tint of the underside, which, instead of being greenish white, is decidedly yellowish, with a tinge of lilacine-pinkish over the lower two-thirds of the hind wings, thus resembling the female specimens from the Transvaal and Bamangwato noted in my 'South-African Butterflies' (iii. p. 92).

89. Teracolus eris (Klug).

♂. *Pontia eris*, Klug, Symb. Phys. t. vi. ff. 15, 16 (1829).

Omaramba-Oamatako (January). One male example.

The solitary specimen in the collection agrees with the usual subtypical form prevalent in South Africa, having the white hind-marginal spot (between 2nd and 3rd median nervules) and marks above the posterior angle of the fore wings.

90. Teracolus agoye (Wallengr.).

♂. *Anthopsyche agoye*, Wallengr. K. Sv. Vetensk.-Akad. Handl. 1857, Lep. Rhop. Caffr. p. 15. no. 11.

Ehanda (August–September). One female example.

The apical patch in the fore wings is larger than usual, and immediately preceded by a very faint tinge of yellow; its dark borders are very faint and diffused. In both fore and hind wings the discocellular terminal dot is more faintly shown, especially on the underside. This specimen is much worn.

91. Teracolus regina (Trim.).

♂ ♀. *Anthocharis regina*, Trim. Trans. Ent. Soc. Lond. 3rd ser. i. p. 520. n. 1 (1863).

Humbe (October). Two male examples.

These are of the typical form, having the underside of the hind wing almost white, with the slightest yellowish tinge.

92. Teracolus evenina (Wallengr.).

♀. *Anthopsyche evenina*, Wallengr. loc. cit. p. 12. n. 3 (1857).

♂. *Anthopsyche deidamia*, Wallengr. Wien. ent. Monatschr. 1860, p. 35. n. 7.

Omrora (August), Ehanda (August–September), Humbe (October), and Omaramba-Oamatako (January). Six examples; four males and two females.

These specimens belong to the variety A (*deidemioides*, Auriv.), described in my 'South-African Butterflies,' iii. p. 127, in which the blackish markings of the upperside are much reduced in the male, and the underside of the hind wings is in both sexes more or less tinged with pinkish-creamy irrorated with grey. Of the two females received, one, from Ehanda, has the dark markings of the upperside much fainter than usual, while the other, from Omaramba-Oamatako, has them very dark and strongly developed.

93. Teracolus simplex, Butl.

♂. *Teracolus simplex*, Butl. Proc. Zool. Soc. 1876, p. 148. n. 71.

Ehanda (August–September). Two male examples.

94. Teracolus antevippe (Boisd.).

♂ ♀. *Anthocharis antevippe*, Boisd. Sp. Gén. Lép. i. p. 572, pl. 18. f. 3 (1836).

Omaramba-Oamatako (January). One male example.

This male is a very fine individual, in perfect condition, and larger than any that I have previously measured (exp. 2 in. 1 line). There is only a very minute trace of black on the middle of the inner edge of the apical bright red patch of the fore wings, and the hind-marginal nervular black marks in the hind wings are sufficiently large to be contiguous, and so to form a very sharply dentated narrow border. On the pure white underside, the nervules of the hind wings and of the apical half of the fore wings are blackish near the hind margin, as in those examples of *T. achine* (Cram.) which are mentioned in my 'South-African Butterflies' (iii. p. 133), as inhabiting the Transvaal and the Eastern South-tropical tracts.

95. Teracolus achine (Cram.).

♀. *Papilio achine*, Cram. Pap. Exot. iv. pl. cccxxxviii. ff. E, F (1781).

Humbe (October), Okavango River (December), and Omaramba-Oamatako (January). Five female examples.

All these specimens exhibit on the white ground of the fore wings a slight tinge of yellow immediately before the inner edge of the orange apical patch; they approach the form *gavisa*, Wallengr., in their upperside marking of the fore wings, but (with the exception of one from Omaramba-Oamatako) are not nearly so heavily marked on the hind wings. On the underside, three of the five have the neuration in parts very finely marked with blackish, which is also a feature indicating approach to *gavisa*. They agree very nearly with specimens collected on the Marico River (in 1883) by Mr. F. C. Selous, and at the junction of that river with the Limpopo (in 1887) by Mr. Eriksson, and tend to strengthen the view that *gavisa* is not truly separable from *T. achine*.

96. Teracolus gelasinus, Butl.

♂. *Teracolus gelasinus*, Butl. Proc. Zool. Soc. 1876, p. 143. n. 52 (1876).

Omrora (August). One male example.

The Angolan specimens on which this species was founded were two taken by the late Mr. J. J. Monteiro, respectively at the Quanza (August 1872) and Ambriz (October 1872). The species belongs to the group of which *T. daira*, Klug, is representative, its nearest ally being the Angolan *T. interruptus*, Butl., which is larger and has the black markings more developed. The male *T. gelasinus* has no dusky stripe along the inner margin of the fore wings, but a male taken in Mashuna-land by Mr. F. C. Selous has a faint marking, representing the extremity of such a stripe, beyond the middle.

97. Teracolus antigone (Boisd.).

♂. *Anthocharis antigone*, Boisd. op. cit. p. 572. n. 19 (1836).

Ehanda (September). One male example.

This specimen has all the blackish markings faint and reduced; the inner-marginal stripe of the fore wings is represented only by a very indistinct spot beyond the middle.

98. Teracolus phlegetonia (Boisd.).

♂. *Anthocharis phlegetonia*, Boisd. op. cit. p. 576. n. 25 (1836).

Omaramba-Oamatako (January). Seven examples; three males and four females.

A good deal of variation in size is shown by these males; the smallest has the inner-marginal black stripe of the fore wings relatively much reduced. In the females the spots in the apical patch of the fore wings vary in tint from dull reddish to dull yellowish grey.

99. Teracolus theogone (Boisd.).

♂ ♀. *Anthocharis theogone*, Boisd. op. cit. p. 575. n. 23 (1836).

Ehanda (August–September) and Humbe (October). Two male examples.

There is no trace in either of these specimens of any longitudinal blackish markings on the upperside.

Genus Callidryas, Boisd.

100. Callidryas florella (Fabr.).

♀. *Papilio florella*, Fabr. Syst. Ent. p. 479. n. 159 (1775).

Ehanda (September), Omrora (November), Otiembora (November–December), and Okavango River (December). Six male examples.

Mr. H. L. Feltham's observation [1], that the males of this butterfly that appear early in the season are all less distinctly freckled and hatched on the underside than those of the midsummer and autumnal brood, was borne out by specimens which he sent to me, and receives further confirmation from Mr. Eriksson's examples. I noted that Mr. Feltham's specimens (from Griqualand West) presented the further peculiarities of smaller size (*exp. al.* 2 in. $2\frac{1}{2}$–6 lin.) and a yellower tint on the underside; and all three distinctive characters are presented by Mr. Eriksson's Ehanda male. The Omrora example (November) is also but faintly marked on the underside; the one from Otiembora is larger and more distinctly marked; and the two taken on the Okavango River in December are full-sized and strongly marked beneath.

[1] See my 'South-African Butterflies,' iii. p. 187, footnote.

Subfamily Papilioninæ.

Genus Papilio, Linn.

101. Papilio antheus, Cram.

Papilio antheus, Cram. Pap. Exot. iii. pl. ccxxxiv. ff. B, C (1779).

Ehanda (August–September). Fifteen male examples.

These specimens, except in not being so large, appear to approach the variety from Lake Nyanza separated by Mr. Butler (Ann. & Mag. Nat. Hist. 5th ser. xii. p. 106, 1883) as *P. lurlinus*, having most of the pale green markings (especially the discocellular waved striæ of the fore wings) wider than usual, and the striæ just referred to (particularly the outermost of them) more strongly bisinuated.

102. Papilio corinneus, Bertol.

Papilio corinneus, Bertol. "Mem. Acad. Sci. Bologn. 1849, p. 9, t. i. ff. 1–3."

Omrora (August). Nine male specimens.

Considerably smaller than usual, expanding from 2 in. 6 lin. to 3 in. One specimen is a notable aberration in colouring, the basal red in both fore and hind wings on the underside being entirely absent, and replaced by the ochre-yellow of the ground-colour.

103. Papilio morania. (Plate IX. fig. 21, ♂.)

Papilio morania, Angas, Kafirs. Illustr. pl. xxx. f. 1 (1849).

Omrora (August). Eighteen male examples.

These specimens, like those of *P. corinneus*, are much below the usual size, expanding from 2 in. $4\frac{1}{2}$ lin. to 6 lin. only. They all belong to a variety approaching *P. corinneus* in the following particulars, viz.: in the fore wings the terminal discocellular white marking is unequally divided by a curved oblique black streak, and the external superior projection of the large white patch is considerable; and in the hind wings the white field is more restricted than in ordinary *morania*, having a somewhat broader hind marginal black border. Nine of the specimens want the small subbasal discocellular white spot in the fore wings, and two others have it very faintly expressed; whereas in typical *morania* this spot is better developed than in *corinneus*[1].

When compared with the typical *P. morania* of the south-eastern coast, this Omrora *variety* is most interesting, as possibly indicating one of the stages in the differentiation of the species from *P. corinneus*, which is itself so near an ally of the more northern *P. pylades*, Fabr.

[1] In connection with these Omrora specimens, which, though on the whole nearer to *P. morania*, exhibit decided variation in the direction of *P. corinneus*, I note here, on the other hand, a male example of the latter (sent to me from Malvern, Natal, by Mr. Cecil N. Barker) which approaches *P. morania* in the markings of the underside of the hind wings, where the four white spots of the submarginal series are nearer to the white field than usual, and are also blackish-edged internally, and the inner marginal red is much fainter towards its extremity.

104. Papilio demoleus (Linn.).

Papilio demoleus, Linn. Mus. Lud. Ulr. Reg. p. 214. n. 33 (1764), and Syst. Nat. i. 2, p. 753. n. 46 (1767).

Omrora (August) and Ehanda (August–September). Ten male examples.

Family Hesperidæ.

Genus Pyrgus, Westw.

105. Pyrgus vindex (Cram.).

Papilio vindex, Cram. Pap. Exot. iv. pl. cccliii. ff. G, H (1781).

Omrora (August) and Omaramba-Oamatako (January). Three male examples.

106. Pyrgus dromus, Plötz.

Pyrgus dromus, Plötz, Mitt. naturw. Ver. Neu-Vorpomm. u. Rügen, 1884, p. 6. n. 13.

Ehanda (August–September). One male example.

107. Pyrgus mafa, Trim.

Pyrgus mafa, Trim. Trans. Ent. Soc. Lond. 1870, p. 386, pl. vi. f. 12.

Ehanda (September). One male.

The single specimen that I believe is referable to this species is smaller than usual, expanding barely 11 lin. The upperside differs in no respect from ordinary *P. mafa*, but on the underside of the hind wings the ground-colour is duller and paler, and the subbasal and median white stripes are rather narrower, more widely interrupted (so as to present a more macular appearance), and (in common with the submarginal series of white spots) with much broader and darker brownish-grey edging.

108. Pyrgus diomus, Hopff.

Pyrgus diomus, Hopff. Monatsb. Akad. Wissensch. Berl. 1855, p. 643; id. Peters, Reise nach Mossamb., Ins. p. 420, t. xxvii. ff. 9, 10 (1862)[1].

Ehanda (August–September) and Omaramba-Oamatako (January). Ten examples; nine males and one female.

The two Ehanda males differ from the rest (and from all other specimens that have come under my notice) in the narrowness of the median white oblique band on the underside of the hind wings, which in one example is not more than half the usual width.

[1] I have not seen any specimen that entirely agrees with Hopffer's figure of the underside, the white bands of the underside of the hind wing being in every instance more oblique. The direction of the bands in this figure is intermediate between that found in *P. dromus*, Plötz, and the decidedly oblique course just referred to.

109. Pyrgus secessus, n. sp. (Plate IX. fig. 22, ♂.)

Allied to *P. sataspes*, Trim.

♂. *Exp. al.* 11 lin. to 1 inch.

Fuscous brown, with small dull white spots; in submarginal series the spots are minute and obsolescent, except two in hind wing (respectively above and below 2nd median nervule). *Fore wing*: three discocellular spots, of which the middle one is very small and situated close to subcostal nervure; discal series of spots in number and arrangement as in *P. sataspes*, but 5th spot largest and more quadrate, while 6th and 7th are much reduced in size. *Hind wing*: a small subbasal discocellular spot; median marking reduced to a moderate-sized terminal discocellular spot, with a rather smaller spot immediately below it. Underside.—*Hind wing and apex of fore wing dull yellow-ochreous with a reddish-brown tinge, the former with the median band very dull creamy (in one of the two examples much darker, scarcely distinguishable from basal ground-colour), rather broad, oblique, almost straight, irregularly denticulated externally, and bounded internally by three separate brown marks. Fore wing*: middle discocellular spot quite as large as the two others. *Hind wing*: subbasal cellular spot, and two others above and a little beyond it (in one specimen obsolescent), indicate an irregular subbasal transverse band; median band externally bounded by dark brown, which gradually shades off into yellow-ochreous; a submarginal sinuated series of minute paler spots very faintly indicated.

Among the more marked distinctions of this form from *P. sataspes* are (besides the dull tint, straightness, and even width throughout of the much broader median band of the underside of the hind wings) the presence in both fore and hind wings of a subbasal discocellular spot, the different relative sizes of the lower spots of the discal series in the fore wings, and the ill-defined, narrow, interrupted (instead of dark, continuous, well-developed) internal border of the median band of the hind wings on the underside. The possession of a subbasal cellular white spot in both fore and hind wings is usual in the genus, but *P. sataspes*, *P. nanus*, and the aberrant *P. sandaster*, Trim., want this feature.

Omrora (10th–25th August). Two male examples.

Genus Pamphila, Fabr.

110. Pamphila callicles (Hewits.).

♀. *Cyclopides callicles*, Hewits. Descr. New Hesp. ii. p. 42. n. 6 (1868); and Exot. Butt. v. pl. 59, ff. 10, 11 (1874).

Omaramba-Oamatako (January). One female example.

111. Pamphila morantii, Trim.

♀. *Pamphila morantii*, Trim. Trans. Ent. Soc. Lond. 1873, p. 122; and ♂, S.-Afr. Butt. iii. p. 311, pl. 12. f. 3 (1889).

Ehanda (August–September), Okavango River (December), and Omaramba-Oamatako (January). Five male examples.

All these have the underside yellow-ochreous, without any ferruginous tinge, belonging to the variation *P. ranoha*, Westw. In one of the two Okavango specimens the small black spots of the underside are wanting, but in the other, though smaller than usual, they are distinct.

112. Pamphila obumbrata, n. sp. (Plate IX. fig. 23, ♂.)

Closely allied to *P. hottentota* (Latr.).

Exp. al. (♂) 1 in. $1\frac{1}{2}$ lin.; (♀) 1 in. 1 lin.

♂. Pale dull greyish brown; inferior half of hind wing and basal half of fore wing suffused with greenish ochreous-yellow; *on lower discal area of fore wing, between 2nd median nervule and submedian nervure, a very large, rounded, highly glossy, fuscous-grey sexual badge, formed of small densely packed tilted scales.* Underside.—Very dull pale yellowish grey. *Fore wing*: two exceedingly faint paler discal spots between 1st and 3rd median nervules (near their origin). *Hind wing*: a discal series of very faint elongate confluent spots, from costa to submedian nervure, sharply angulated on 2nd subcostal nervule.

♀. Without any yellow suffusion. *Fore wing*: five small yellowish spots in discal series, viz.: two minute ones together close to costa, and three obliquely placed between 3rd median nervule and submedian nervure. *Hind wing*: a faint trace of a macular yellowish-white streak in upper part of disk. Underside.—Slightly yellower than in male, the hind-wing markings less indistinct. *Fore wing*: besides the five discal spots of upperside, there is a trace of two additional minute spots, beyond the rest, between 1st radial and 3rd median nervules.

Besides the extraordinary sexual badge, a more pointed apex characterizes the fore wing in the male, and the hind wing is more prominently lobate at the anal angle than in *P. hottentota*. The female example is much worn, but appears to be singularly close to the typical female *P. hottentota*, except in the failure of yellow on both surfaces.

Ehanda (August–September). Two examples; a male and a female.

113. Pamphila occulta, n. sp.

Allied to *P. hottentota* (Latr.) and *P. lugens*, Hopff.

Exp. al. (♂) 1 in. $1\frac{1}{2}$–3 lin.; (♀) 1 in. 3 lin.

♂. *Dull brown. Fore wing*: *a fuscous-brown cloud from base to beyond middle of costa, covering discoidal cell and extending downward to submedian nervure about middle*; commencement of a discal macular series very faintly indicated by a costal transverse row of three minute pale spots, in the customary position beyond extremity of discoidal cell. Underside.—*Very much paler*; *hind wing and costal and apical area of fore wing rather sparsely sprinkled with hoary scales. Fore wing*: usual discal series of seven small whitish spots tolerably distinct. *Hind wing*: an elbowed discal series of five or six indistinct small whitish spots ; inner marginal fold glossy pale grey.

Palpi, thorax, and abdomen beneath uniform dull whitish.

♀. Uniform pale dull brown. *Fore wing*: discal macular series as on underside of male in position and arrangement, but larger, whiter, quite distinctly defined, and subvitreous. UNDERSIDE.—Very slightly tinged with yellowish. *Fore wing*: discal spots as on upperside. *Hind wing*: discal spots more distinct than in male.

This exceedingly obscure little species is distinguished from *P. hottentota* by its much duller (and in the male darker) upperside without any yellowish suffusion, and by the want (in the male total) of yellow colouring on the underside, as well as by the small size, separateness, and whitish tint of the discal series of spots on the underside of the hind wings; the whitish instead of yellow tint of the underside of the palpi and body is also a distinction, and the marked prolongation of both the fore and hind wings more resembles that presented by *P. monasi*, Trim. The colouring of *P. occulta*, however, is not nearly so dark as that of *P. lugens*, Hopff., which is also a larger butterfly, with broader and blunter wings, and has the underside almost as dark as the upperside. But for the almost entire suppression of the discal spots of the fore wings in the male, *P. occulta* looks much like a miniature of *P. fatuellus*, Hopff.

I have received two Transvaal males of this insect, one without locality or date, but the other captured at Barberton by Mr. C. F. Palmer early in 1888; and a third, taken at Potchefstroom by Mr. T. Ayres, which differs from all the rest in being totally devoid of the usual small indistinct spots.

Omrora (August), Otiembora (November–December), and Okavango River (December). Two male and two female examples.

114. PAMPHILA MORITILI (Wallengr.).

♀. *Hesperia moritili*, Wallengr. K. Sv. Vet.-Akad. Handl. 1857, Lep. Rhop. Caffr. p. 49. n. 4.

Humbe (October). One male example.

115. PAMPHILA AYRESII, Trim.

♂ ♀. *Pamphila ayresii*, Trim. S. Afr. Butt. iii. p. 321, pl. 12. f. 1 (1889).

Omrora (August) and Ehanda (August–September). One male and two female examples.

116. PAMPHILA BORBONICA (Boisd.).

Hesperia borbonica, Boisd. Faune Ent. de Madag. p. 65. n. 3, pl. 9. ff. 5, 6 (1833).

Otiembora (November–December). One male example.

117. PAMPHILA MOHOPAANI (Wallengr.).

♀. *Hesperia mohopaani*, Wallengr. loc. cit. p. 48 (1857).

Ehanda (September). One male example.

Genus Abantis, Hopff.

118. Abantis venosa, Trim. (Plate IX. fig. 24, ♂.)

♂. *Abantis venosa*, Trim. S.-Afr. Butt. iii. p. 339. n. 361 (1889).

Leucochitonea umvulensis, E. M. Sharpe, Ann. & Mag. Nat. Hist. 6th ser. vol. vi. p. 348 (Oct. 1890).

Omrora (August) and Ehanda (August–September). Three male examples.

These specimens have already been described, as "variety A" of the species, in my work above quoted, one of the two Ehanda examples being further noted (p. 340, footnote) as wanting the vitreous spots of the fore wings and having the white and black on the underside of the hind wings obsolescent.

119. Abantis paradisea (Butl.).

♂. *Leucochitonea paradisea*, Butl. Trans. Ent. Soc. Lond. 1870, p. 499; and Lep. Exot. p. 167, pl. lix. f. 8 (1874).

Ehanda (September). One male example.

The white markings in this specimen have a decided yellowish tinge, giving it some resemblance to the female.

120. Abantis zambesina, Westw.

♂. *Hesperia* (*Oxynetra*) *zambesina*, Westw. Thes. Ent. Oxon. p. 183, pl. xxxiv. f. 9 (1874).

Omrora (August) and Ehanda (August–September). Seventeen male examples.

I noted these specimens of this extremely beautiful Hesperid last year in vol. iii. of my work above cited (p. 344). In a footnote I called attention to the circumstance that the sides of the abdomen are pure white, and suggested that their being dull yellowish in the type-specimen figured by Westwood was due to discoloration. Since then one of Mr. Eriksson's examples has changed from white to ochreous-yellow in the part mentioned.

121. Abantis levubu (Wallengr.).

♂. *Leucochitonea levubu*, Wallengr. op. cit. p. 52 (1857).

♂ ♀. *Abantis levubu*, Trim. S.-Afr. Butt. iii. p. 345, pl. 12. f. 5 [♂] (1889).

Omrora (November), Otiembora (November–December), and Omaramba-Oamatako (January). Eight male examples.

In the fore wings the black on margins and nervules is more developed than in specimens received from more southern tracts.

Genus Pterygospidea, Wallengr.

122. Pterygospidea motozi, Wallengr.

Pterygospidea motozi, Wallengr. op. cit. p. 53 (1857).

Ehanda (August–September). Two male examples.

One of the specimens is of a greyer tint than usual, especially on the underside, where the pale ochre-yellow tint is reduced to a mere tinge of the pale greyish-brown ground. The other, although a male, agrees with the female examples noted in my 'South-African Butterflies' (iii. p. 358)—from Natal and Delagoa Bay—as having the vitreous spots of the fore wing much reduced in size; it also has, to a greater extent, the sparse discal hoary scaling on the upperside of both fore and hind wings which characterizes those examples. From the occurrence of other examples of both sexes recently on the Natal coast, I am disposed to think it not unlikely that this supposed variety of *P. motozi* may prove to be a distinct species.

123. PTERYGOSPIDEA JAMESONI. (Plate IX. fig. 25.)

Antigonus jamesoni, E. M. Sharpe, Ann. & Mag. Nat. Hist. 6th ser. vol. vi. p. 348 (Oct. 1890).

Allied to the North-Indian *P. bhagava* (Moore).

Exp. al. 1 in. 5–7 lin.

♂. *Pale ochre-yellowish-brown, with conspicuous white vitreous black-edged spots in fore wing, and a very broad median white band (marked externally with black spots) in hind wing; cilia white, interrupted at extremity of nervules with brown in fore wing and with black in hind wing. Fore wing*: terminal discocellular spot large, more or less rounded; spots in discal row nine, larger than usual, all very distinct, arranged in three groups, viz.: two smallest, united, next costa; three somewhat larger, rounder, separate, forming a curved row below and beyond first two; and four below discoidal cell, of which the uppermost (between 3rd and 2nd median nervules) is separate and of moderate size, while the remaining three (of which the uppermost, between 2nd and 1st median nervules, is the largest on the wing) are more or less closely united in a slightly oblique line beneath terminal discocellular spot. *Hind wing*: basal area of a darker tint; inner edge of broad white band well-defined, almost straight, outer edge rather suffused with ground-colour on nervules; black spots very conspicuous, forming a roughly semicircular series of nine, of which the first is on the brown *inner* edge of white band (between costal and subcostal nervules), but all the rest, from costal to submedian nervure, a little within the outer edge. UNDERSIDE.—Paler, the ground-colour without ochre-yellow tinge. *Fore wing*: edgings of vitreous spots very attenuated and in parts obsolete; some whitish scaling near base and along inner margin. *Hind wing*: basal area greyish white except on costal border; white band extending rather further beyond black spots, which are in five specimens rather smaller (especially the 3rd, 4th, and 5th).

Head and body of ground-colour above (the four terminal abdominal segments with slender white half-rings); white beneath, including palpi. Antennæ black above, whitish beneath.

This delicately tinted species clearly belongs to the group named *Satarupa* by Moore (Proc. Zool. Soc. 1865, p. 780), which is characterized by the hind wings presenting on both surfaces a broad median white or whitish band bearing black spots externally, and also by the completeness and strong upper curve of the discal series of vitreous spots in the fore wings. Though not distantly related to *P. bhagava* (Moore), *P. jamesoni* is nearer to an allied form, from Coimbatoor and Moulmein, in the British Museum, but differs from the latter in its paler yellower ground-colour, larger fore-wing spots (with better developed black edges), whiter, inferiorly narrowed (instead of widened) hind-wing band, and varied instead of plain cilia.

Miss E. M. Sharpe describes this species as inhabiting the Umvuli, a river in Mashuna-land.

Omrora (August). Six male specimens.

Genus Hesperia, Fabr.

124. Hesperia forestan (Cram.).

Papilio forestan, Cram. Pap. Exot. iv. pl. cccxci. ff. E, F (1782).
Otiembora (November–December). One male example.

125. Hesperia pisistratus, Fabr.

Hesperia pisistratus, Fabr. Ent. Syst. iii. 1, p. 345. n. 311 (1793).
Omrora (November). One female example.

EXPLANATION OF THE PLATES.

Plate VIII.

Fig. 1. *Acræa atolmis*, ♂, p. 63.
2. —— *atolmis*, ♀.
3. —— *atolmis*, var. ♀.
4. —— *atolmis*, ♂, Summer or Wet-Season Form (*acontias*, Westw.).
5. —— *felina*, ♂, p. 65.
6. —— *felina*, ♀.
7. —— *onerata*, ♂, p. 67.
8, 8 *a*. —— *onerata*, ♀.
9. —— *asema*, ♂, p. 68.
10, 10 *a*. —— *asema*, ♀.

Plate IX.

Fig. 11. *Acræa ambigua*, ♀, p. 70.
12. *Crenis natalensis*, var. ♂, p. 76.
13. *Deudorix obscurata*, ♂, p. 84.
14. *Hypolycæna cæculus*, ♂, Summer or Wet-Season Form, p. 85.
15. *Aphnæus erikssoni*, ♀, p. 86.
16. —— *modestus*, ♂, p. 87.
17. *Zeritis damarensis*, ♂, p. 90.
18. *Erikssonia acræina*, ♂, p. 92.
19. —— *acræina*, ♀.
20. —— *acræina*, var. ♂.
21. *Papilio morania*, var. ♂, p. 100.
22. *Pyrgus secessus*, ♂, p. 102.
23. *Pamphila obumbrata*, ♂, p. 103.
24. *Abantis venosa*, ♂, p. 105.
25. *Pterygospidea jamesoni*, ♂, p. 106.

4. On a Specimen of the White Bream (*Abramis blicca*, Bloch) without Pelvic Fins. By H. H. Brindley, M.A., St. John's College, Cambridge.

[Received January 3, 1891.]

(Plate X.)

The fish forming the subject of this communication was obtained from the Cam last August. It is a specimen of *Abramis blicca*, Bl., of which the commonest English name, the "White Bream," distinguishes the species from the Common or Yellow Bream (*A. brama*). The former fish is described by Jenyns [1] as "very common in the Cam" and as the "Breamflat" of the fen fishermen. The specimen exhibits all the appropriate specific characters except as regards the pelvic fins, which are altogether absent. A normal example of the species was captured at the same place and during the same hour, and for the sake of comparison an outline of it is given below the figure of the abnormal fish.

In the normal example the ventral surface from below the posterior edge of the operculum to the origin of the pelvic fins is flattened and is covered by four rows of scales, the scales of the two outer rows having their outer edges bent upwards to interlock with the scales of the lowest rows of the sides of the body and so round off the sides of the ventral surface. Posteriorly to the pelvic fins the ventral surface suddenly becomes sharp or rather ceases to be present, the ventral edges of the scales in the lowest rows of the sides of the body meeting in the ventral line.

This ventral compression of the body into an edge behind the pelvic fins is a generic character [2].

The above are also features of the abnormal example, subject to the following modification at the proper place of origin of the pelvic fins. The four last scales of each row of the posterior end of the flattened portion of the ventral surface are of about the same size and shape as the antecedent scales, but overlap each other much more than the latter, viz. to the extent of about two-thirds of their individual areas. These scales are, however, arranged regularly and cover completely the proper place of origin of the absent fins.

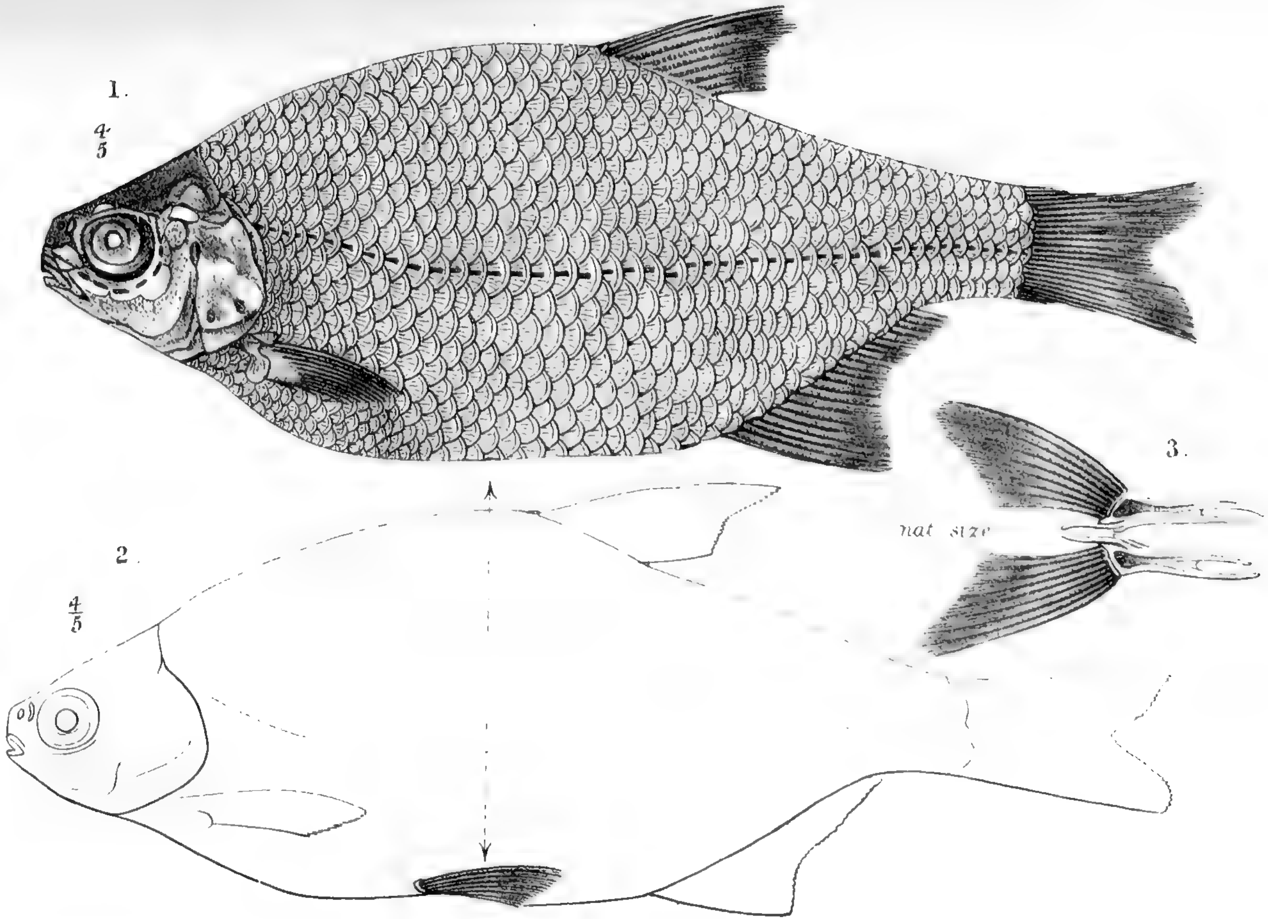
Dissection of the body-wall in this region, by stripping off the different layers one by one, revealed no irregularity of arrangement, the myocommas meeting in the ventral line in the same manner as in the rest of the region between the pectoral and anal fins.

On macerating the muscles, no trace of a pelvic girdle was found.

The case is therefore one of entire absence of the pelvic girdle and appendages, their presence normally not being suggested by any rudiments. That the defect is congenital and not the result of accidental injury, which would be unlikely on other grounds, is indicated by the absence of any external mark or scar and the complete regularity in the musculature.

[1] L. Jenyns, 'Manual of British Vertebrate Animals,' 1825.

[2] A. Günther, 'Catalogue of Fishes in British Museum,' vol. vii. p. 300.



H. H. Brindley del. J. Smit lith.

Mintern Bros. imp

ABRAMIS BLICCA.

The fish is 19·5 cm. in length (with caudal) and weighs 74 grms. It is interesting to note that, in spite of its totally wanting one pair of organs of locomotion, the specimen had, when caught, every appearance of being in as good condition and as well nourished as the normal fish of about equal size obtained from the same shoal, and most likely therefore of about the same age.

In connection with this case of abnormal absence of pelvic fins may be mentioned the fact that their *normal* absence among Teleostei is a much more frequent specific character than the absence of pectorals.

Day [1] mentions that pelvic fins were entirely absent in eleven out of thirteen specimens of *Gasterosteus pungitius* obtained by him in Ireland, and when present were very small. This abnormality was accompanied by modifications or absence of the pubic plate and ventral spine. In all the examples of *G. spinachia* and *G. aculeatus* pelvic fins were present.

I am indebted to Prof. G. B. Howes for a Goldfish, 7 cm. in length, in which the left pelvic fin is absent, the other being well developed. The abnormal Bream has been placed in the Museum of the Royal College of Surgeons.

DESCRIPTION OF PLATE X.

Fig. 1. Specimen without pelvic fins.
Fig. 2. Outline of normal fish.
Fig. 3. Ventral view of pelvic girdle and fins of 2.

5. Notes on the Osteology of *Heloderma horridum* and *H. suspectum*, with Remarks on the Systematic Position of the *Helodermatidæ* and on the Vertebræ of the Lacertilia. By G. A. Boulenger.

[Received January 6, 1891.]

The skeleton of a fully adult specimen of *Heloderma horridum*, obtained by Dr. A. Buller in Mexico, has recently been prepared for exhibition in the galleries of the Natural History Museum, and at the same time Professor Stewart prepared a skeleton of an adult *H. suspectum* for the Museum of the Royal College of Surgeons. It appeared to me that it would be interesting on this occasion to make a comparison of the skeletons of the two species and to record whatever differences they might present; for although a good deal has been published on the osteology of *H. horridum* [2] and *H. suspectum* [3], no direct comparison of the two has yet been made.

[1] F. Day, "On some Irish Gasterostei," Journ. Linn. Soc., Zool. vol. xiii. 1878.

[2] Troschel, F. H. De Helodermate horrido. Orat. in facult. phil. Bonnensi. Bonn, 1851.
Troschel, F. H. Arch. f. Nat. 1853, p. 294, pls. xiii. & xiv.
Kaup, J. Arch. f. Nat. 1865, p 33, pl. iii.
Gervais, P. Journ. de Zool. ii. 1873, p. 453, pl. xii.

[3] Shufeldt, R. W. P. Z. S. 1890, p. 214, pls. xvii. & xviii.

With the kind aid of Professor Stewart, I have been able to bring together and compare the following material :—

H. horridum, Wiegm.

1. Adult ♀ skeleton from Salina Cruz, Mexico, obtained by Dr. A. Buller. In the British Museum.
2. Imperfect skull of a younger (half-grown) specimen from Mexico, extracted from an old skin. In the British Museum.

H. suspectum, Cope.

1. Adult ♀ skeleton. In the College of Surgeons.
2. Disarticulated skeleton, without the skull, of an adult ♂. In the College of Surgeons.
3. Right moiety of skull. In the British Museum.

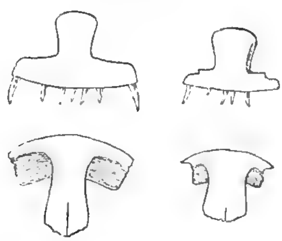
In the following notes I have limited myself to the skull and vertebral column[1], which have alone yielded specific differences, the other parts of the skeleton of the two species not differing in any important point, so far as I can see.

Skull.

The following characters distinguish the skulls of *H. horridum* and *H. suspectum* :—

In the latter, the oral portion of the præmaxillary is narrower, and its ascending internarial bar wider, than in the former—this

Fig. 1.



Præmaxillaries of *H. horridum* and *H. suspectum.*
Front view and upper view; nat. size.

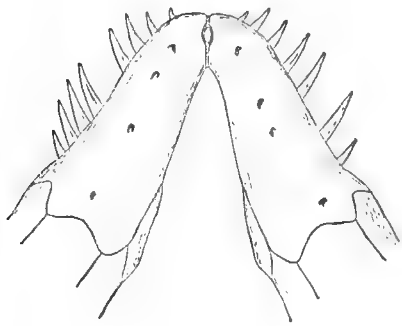
internarial bar measuring, at its narrowest point, one third instead of one fourth or one fifth of the greatest width of the bone. Eight or nine præmaxillary teeth are present in *H. horridum*, and only six in *H. suspectum*. Dr. Shufeldt, however, represents eight teeth in the latter species; but his figure, showing all the teeth as of the

[1] I must, however, remark that the number of phalanges is 2, 3, 4, 5, 3 in the manus, as correctly described by Shufeldt, whose figure, nevertheless, represents only four in the fourth finger, and 2, 3, 4, 5, 4 in the pes. Through terming the fifth metatarsal bone a tarsal, Shufeldt allows *Heloderma* but three phalanges in the fifth toe.

same size, looks very diagrammatic; the outer præmaxillary teeth are always larger than the median. The postorbital arch is more slender in *H. suspectum*. Palatine and pterygoid teeth appear to be constantly absent in *H. suspectum*, whereas they are present in both skulls of *H. horridum* examined by me as well as in those described by Troschel and by Kaup, who first noticed their presence. It is remarkable to find so important a difference between two species so closely allied. The presence of palatine teeth is quite exceptional among Lacertilia; they are only known in two other genera, viz., *Ophisaurus* and *Chamæleolis*. My adult specimen has six or seven teeth on each pterygoid and three on each palatine; the younger specimen has only one palatine and two pterygoid teeth on each side.

I was much surprised to find on the adult skull of *H. horridum* a small azygous ossification in the cartilage of the mandibular symphysis, apparently the homologue of the symphysial (mento-meckelian) bones of most tailless Batrachians. On referring to Dollo's paper on the skull of *Iguanodon* [1], I find that an apparently similar ossification has been noticed by Kölliker [2] in Man. Whether the præsymphysial bone (Dollo) of Dinosaurs is homologous with this is still questionable, especially since the discovery of a corresponding bone in the upper jaw, the "rostral bone" of Marsh [3]. The con-

Fig. 2.



Symphysial portion of mandible of *H. horridum*.
Lower view; nat. size.

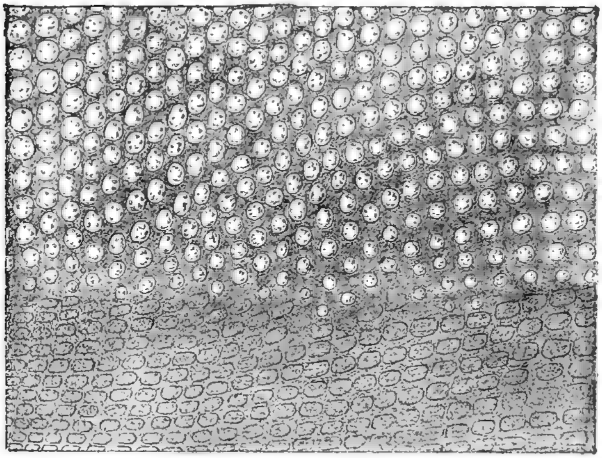
dition of this little bone in *Heloderma* appears to be very much the same as in Man, as far as may be judged from the few words devoted to it by Kölliker, and it is likewise only of exceptional occurrence, as I have failed to find a trace of it in any but this solitary specimen.

Another individual peculiarity of this same skull of *H. horridum* is the presence of a small tooth-like bony knob on the anterior portion of the under surface of the basioccipital, such as is often found,

[1] Bull. Mus. Belg. ii. 1883, p. 224.
[2] Entwickelungsgeschichte des Menschen, &c., 2nd ed. p. 473.
[3] Am. Journ. Sci. xxxix. 1890, pp. 81, 418.

more or less developed, in the Ophidians. As observed by Shufeldt, the bony dermal tubercles of the head are so intimately adherent to the bones that it is extremely difficult to remove them in adult specimens; but in the half-grown skull of *H. horridum*, which is quite as large as that of the adult *H. suspectum*, they could be detached very readily, and the skull shows all the sutures perfectly distinct, as correctly figured by Gervais and by Bocourt[1]. I may add that bony tubercles are also present on the dorsal and lateral

Fig. 3.



Skin of the middle part of the body of *H. suspectum*, epidermis removed, showing the bony tubercles; nat. size.

surfaces of the body, but wide apart and gradually diminishing in size towards the ventral surface, which is entirely devoid of dermal ossifications or shows mere ring-like traces of them, except on the præanal region, which, like the back, is studded with bony tubercles.

Vertebral Column.

This consists of 8 cervical, 26 dorsal, 2 sacral, and 40 caudal (=76) vertebræ in *H. horridum*, of 8 cervicals, 26 or 28 dorsals, 2 sacrals, and 27 caudals (=63 or 65) in *H. suspectum*. In the (♀) specimen of the latter species, with 28 dorsal vertebræ, both centrum and arch of the 21st vertebra are anchylosed with the 22nd.

I was anxious to examine the atlas, as I had been much struck by Dr. Shufeldt's statement (P. Z. S. 1890, p. 214) that it is "composed of five separate pieces; three of these are devoted to the formation of its anterior cup for the cranial condyle. Of these three pieces, one is a mid-ventral one, while either of the others are ventrolaterally situated. Each side of the neural arch is formed by one of the two of the remaining pieces of the five of the component elements of this vertebra; and in a large specimen of this lizard none

[1] Miss. Sc. Mex., Rept. pl. xx. E.

of these five parts had co-ossified." I can, however, now confidently affirm that Dr. Shufeldt has been deceived in his examination. The atlas-ring of *Heloderma* is formed, as in all Reptiles, of three pieces, a ventral and two dorso-lateral. The presence of five elements in the atlas-ring, if such had been the case, would have entirely upset the current view on the morphology of the vertebral column, which holds the said ring to be formed of the neural arch of the atlas and the proatlanto-atlantic hypapophysis or intercentrum; the centrum of the atlas being either free behind the ring or fused with the centrum of the vertebra following (odontoid process of the epistropheus). I regard the views held by Cope [1], Baur [2], and Credner [3] on the morphology of the vertebral column, based as they are on the evidence of the primitive structure afforded by many Stegocephalians, as thoroughly sound, and borne out by everything we know of the structure of recent and fossil Reptiles.

The vertebræ of Reptiles are composed of the following elements:—Neural arch (neurapophyses), centrum, and intercentrum (hypapophyses, subvertebral wedge-bones, chevrons). No Reptile shows an exogenous hypapophysis together with an autogenous hypapophysis, wedge-bone or chevron on the same centrum [4], and the continuity of the series of intercentral autogenous hypapophyses throughout the vertebral column, together with the gradual passage of the wedge-bones into the chevrons, is clearly exhibited in *Sphenodon* and the Geckos. The homology of the cervical hypapophyses with the chevrons is further manifested by such Squamata as have the chevrons attached to a single centrum, viz., the *Anguidæ*, *Varanidæ*, and *Mosasauridæ*, having the cervical hypapophyses likewise on the centrum; whilst those having the chevrons intercentral, viz., the *Agamidæ*, *Iguanidæ*, *Lacertidæ*, most *Scincidæ*, *Chamæleontidæ*, &c., have also the cervical hypapophyses so disposed.

In *Sphenodon* and Geckos, in which the branches of the anterior chevrons are united at the base, the hypapophysis anterior to the first chevron is single, but when the chevrons are V-shaped the hypapophysis preceding them is paired. Such is the case in *Heloderma*, and I have observed the same thing in many other Lizards, where these little bones bear much resemblance to the cervical hypapophyses of many Chelonians, or of *Lacerta agilis*, as figured by Leydig (Deutschl. Saur. pl. iv. fig. 53). I believe, however, that paired autogenous hypapophyses have not been recorded before in the caudal region of Lizards. The paired inferior processes of the caudal vertebræ of Snakes must be likewise regarded as homologous

[1] Amer. Nat. 1878, p. 327, and Tr. Am. Philos. Soc. (2) xvi. 1888, p. 243.

[2] Biol. Centralbl. vi. 1886, p. 332.

[3] Zeitschr. deutsch. geol. Ges. xlii. 1890, p. 260.

[4] Hulke (P. Z. S. 1888, p. 422) states that in the cervical vertebræ of *Trachydosaurus rugosus* "the '*intercalary*' or *intercentrum* coexists with a genuine [exogenous] *hypapophysis*;" but I have been unable to find any substantiation of this statement on a specimen of that Lizard in the College of Surgeons, which I have had especially cleaned for examining this point. It is possible that the part termed by Hulke *intercentrum* is an epiphysis of the hypapophysis such as is so well developed in *Varanus* and *Mosasauria*.

with the chevrons, especially if we look at the state of things in the anterior caudal region in the Mosasaurs, where we find distally disconnected paired hypapophyses, whether fused with the centrum (*Mosasaurus*)[1] or not (*Liodon*), passing into true chevrons.

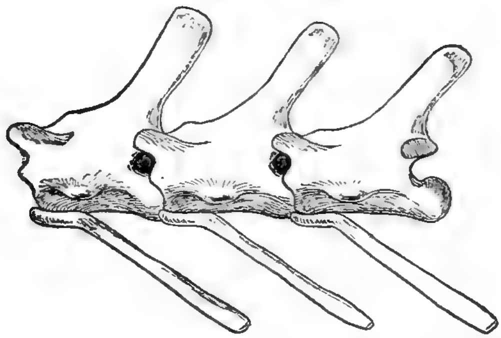
As to the term to be employed for the element under discussion, we have the choice between Owen's *hypapophysis*[2] and Cope's later *intercentrum*. The objection that may be made to the former term, of implying a process of the centrum, may be set aside from the fact that Owen himself intended it for auto- as well as exogenous formations, the two being, as far as Reptiles are concerned, certainly homologous—the exogenous hypapophyses of the cervical region of certain Lizards and Snakes, and of the caudal region of Snakes and certain Mosasaurians, being nothing but the primitively autogenous and intercentral elements (intercentra) shifted forwards or backwards as the case may be[3] and fused with the centrum. And Cope's term

[1] The chevrons are also anchylosed to the centrum in *Diploglossus* and *Ophisaurus*.

[2] The term *hæmapophysis* should be entirely discarded, as based on a theoretical conception which is not borne out by our present knowledge. The loose application of the term *hæmal spine* by Owen is best shown in one of his later papers (Quart. Journ. Geol. Soc. 1877, p. 709), where "*hæmal spine*" stands for the cervical hypapophysis of *Iguana*, the hypapophysial epiphysis of the cervical vertebræ of *Clidastes*, as well as for the chevrons. The denomination *hæmal crest* or *hæmal spine* should be restricted to such ventral outgrowths of the centra as the keel found in many Chelonians or the long process of the lumbar vertebræ of the Rabbit.

[3] On examining a large variety of skeletons of Lizards, it is obvious that the intercentral chevrons have in most cases been shifted forwards, as every passage can be found between the position they occupy in *Gecko* and *Iguana* on the one hand, and *Varanus* and *Mosasaurus* on the other. But in *Tupinambis*, a mem-

Fig. 4.



Caudal vertebræ of *Tupinambis nigropunctatus*; nat. size.

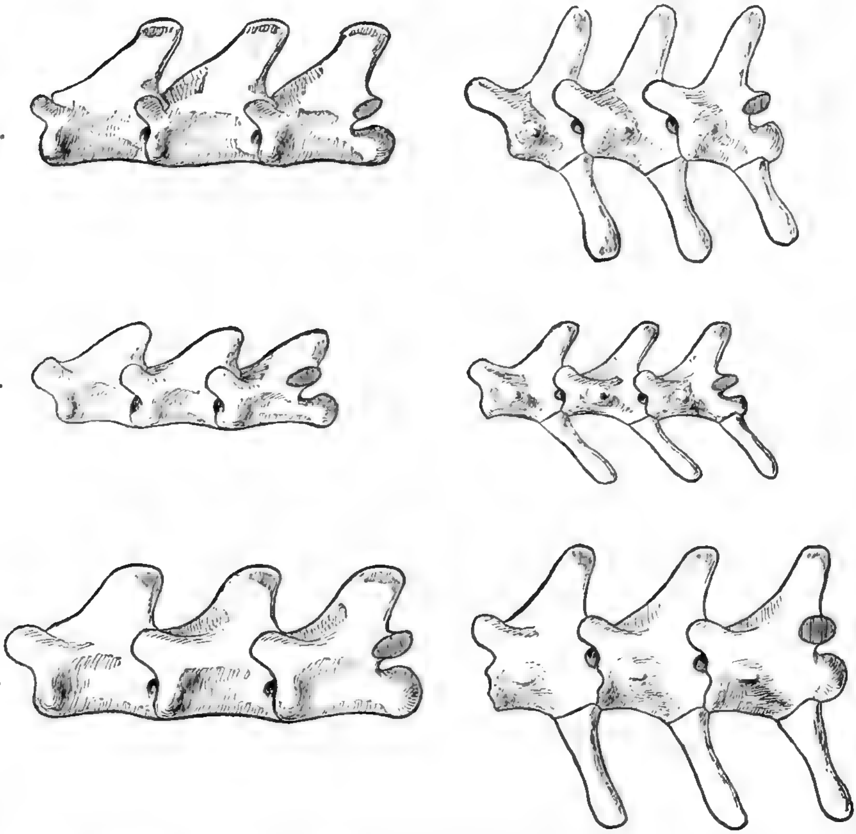
ber of the family *Teiidæ*, I find a very curious form of chevrons: the branches are in their proximal portion horizontal and applied against the centrum posterior to their intercentral attachment, the descending portion originating a little in advance of the middle of the centrum. We may easily imagine that such an arrangement may lead, by the fusion of the basal portion of the hypapophyses with the centrum, to a form of chevron comparable to that of a *Varanus*, but by a totally different process of evolution. By the way, it may be men-may be likewise objected to on the ground that it is not expressive of the position assumed by the element in a great number of Reptiles.

Fig. 5.

a.

b.

c.



Three posterior dorsal and three anterior caudal vertebræ of *Heloderma suspectum*, ♂ (*a*) and ♀ (*b*), and *H. horridum*, ♀ (*c*); nat. size.

I therefore think it best to retain the name *hypapophysis* (Owen), of which *intercentrum* (Cope) becomes a synonym.

Turning back again, after this somewhat lengthy digression, to the

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tioned that the zygosphenal articulation of the vertebræ exists in *Tupinambis* and *Teius* as in most *Iguanidæ*. Owen was mistaken in denying the existence of the zygosphene in *Amblyrhynchus*, where it is present as in most Iguanoids, including *Phrynosoma* and *Basiliscus*; only two Iguanoid genera are known to me to lack this additional articulation, viz., *Anolis* and *Polychrus*.

It appears to me very probable that the Lizards from the Eocene of Wyoming, described by Marsh (Am. Journ. (3) iv. 1872, p. 299) under the name of *Thinosaurus*, as having vertebræ resembling those of *Varanus*, but with zygosphenal articulation, belong to the family *Teiidæ*, and there can be no shadow of a doubt that the Cretaceous (Neocomian) *Hydrosaurus lesinensis* of Kornhuber (Abh. geol. Reichsanst. v. 1873, H. 4, pl. xx.), placed by Zittel in the *Varanidæ*, belongs to the *Dolichosauridæ*, possibly to the genus *Dolichosaurus* proper.

comparison of the vertebral columns of the two species of *Heloderma*, we have merely to notice the following differences:—A short rib is present on the third cervical in *H. horridum*, which is absent in *H. suspectum*; the neural spines are more elevated in the middle and posterior portion of the dorsal region in *H. horridum*, specimens of the same sex, of course, being compared. The neural spines are much more developed in the male.

Systematic Position of Heloderma.

That *Heloderma* is the type of a distinct family of Lizards is now universally admitted, but views differ as to its position in the system. The place of the *Helodermatidæ* between the *Anguidæ* and the *Varanidæ*, which I assigned to them in 1884, is, I still think, the most natural. They agree with the *Anguidæ* in the structure of the tongue and the presence of dermal ossifications[1], and it is probable that direct comparison of them with the numerous remains from the Eocene of Wyoming, described by Marsh (Am. Journ. (3) i. 1871, p. 456, and iv. 1872, pp. 302 and 305) as *Glyptosaurus*, would reveal their closer resemblance to these than to any of the existing members of that family. Marsh remarks of his *Glyptosaurus* that "the head was covered with large osseous shields, symmetrically arranged and highly ornamented, resembling in this respect the modern *Heloderma*." In *G. rugosus* "the prefrontal and post-frontal bones approach each other above the orbit."

The agreement with the *Varanidæ* is in the arrangement of the bones of the palate and the presence of descending laminæ of the frontals forming a bridge under the olfactory lobes of the brain (a character shown by the *Geckonidæ*, *Uroplatidæ*, *Eublepharidæ*, and Snakes[2]). Apart from the secondary character of the presence of grooves, the teeth of *Heloderma* resemble those of *Anguis* and *Varanus*. The most important character which differentiates *Heloderma* from all other Lizards is the presence of a bony postorbital arch, combined with the absence of a zygomatic arch. The absence of a transverse limb to the interclavicle is not of more than generic importance, as it occurs also in an Agamoid, *Lophura*, and the reverse modification, viz., the suppression of a longitudinal limb, in an Iguanoid, *Phrynosoma*.

The latest attempt at fixing the systematic position of *Heloderma* is Baur's[3] proposal to group the *Varanidæ*, *Mosasauridæ*, and *Helodermatidæ* together as follows:—

PLATYNOTA.	VARANOIDEA..........	*Varanidæ.* *Mosasauridæ.*
	HELODERMATOIDEA....	*Helodermatidæ.*

[1] Through a printer's error, it is stated in my 'Catalogue of Lizards,' vol. ii. p. 266, that the dermal plates "are provided with a system of fine tubercles." *Tubercles* is so obviously a misprint for *tubules* that I should not have thought it worth while to correct the statement here but for the fact that it has been repeated in several recent palæontological works.

[2] But not by the Mosasaurs.

[3] Science, xvi. 1890, p. 262.

Although fully admitting the name *Pythonomorpha* [1] to have been ill chosen, I cannot but agree with Prof. Cope in maintaining the Mosasaurs as a suborder, if only for the hyperphalangy of their limbs [2] and the type of their dentition, the large osseous bases which bear the teeth being inserted in a groove of the jaws, a feature which may be regarded as midway between the thecodont and acrodont types; whereas the Monitors and Heloderms belong to the pleurodont type. The *Helodermatidæ* on the other hand are true Lacertilia, more closely related, in my opinion, to the *Anguidæ* than to the *Varanidæ*. And although there are undoubtedly many points common to the Monitors and the Mosasaurs, I hold that Dr. Baur is mistaken in proposing to revert to the Cuvierian views o the affinities of the large extinct marine Reptiles. Dr. Baur says: "It is evident that the *Mosasauridæ* are very closely related to the *Varanidæ*. They simply represent highly specialized aquatic forms." Does this mean that limbs so strongly specialized as those of the Monitors can have been modified into the paddles of the Mosasaurs? A glance at the figures (see fig. 6, p. 118) suffices to refute such a theory. But we can perfectly well conceive the hind limb of a Dolichosaurian becoming modified into the said paddle; and I can see no reason for not regarding these Cretaceous Lizards as the progenitors of the Mosasaurs, and at the same time of the true Lacertilia of which the Pleistocene and recent *Varanidæ* are a family. This view is besides in accordance with the suggestion made by Dollo [3], that the progenitors of the Mosasaurs must have possessed the zygosphenal articulation.

The Order Squamata may very well be divided into the following five Suborders, merely with regard to the structure of the limbs and vertebral column:—

A. Pectoral arch or its rudiments present. Caudal hypapophyses forming chevrons.
- I. *Dolichosauria*. 15–17 cervical vertebræ. Extremities (Fig. 6 A, p. 118) archaic, *i. e.*, approaching the Batrachian type.
- II. *Pythonomorpha*. 9 or 10 cervical vertebræ. Extremities (Fig. 6 B, p. 118) paddle-shaped, with hyperphalangy.
- III. *Lacertilia*. 8 or 9 cervical vertebræ. Fibula reduced proximally; fifth metatarsal reduced in length and strongly modified (Fig. 6 C, p. 118).
- IV. *Rhiptoglossa*. 5 cervical vertebræ. Extremities pincer-shaped; all the metatarsals reduced in length and strongly modified (Fig. 6 D, p. 118).

B. No trace of pectoral arch. Caudal hypapophyses disconnected distally.
- V. *Ophidia*.

[1] *Pythonomorpha*, Cope, 1869, = *Mosasauria*, Marsh, 1880.
[2] At least three phalanges in digit I.
[3] Bull. Soc. Belge Géol. iv. 1890, p. 167.

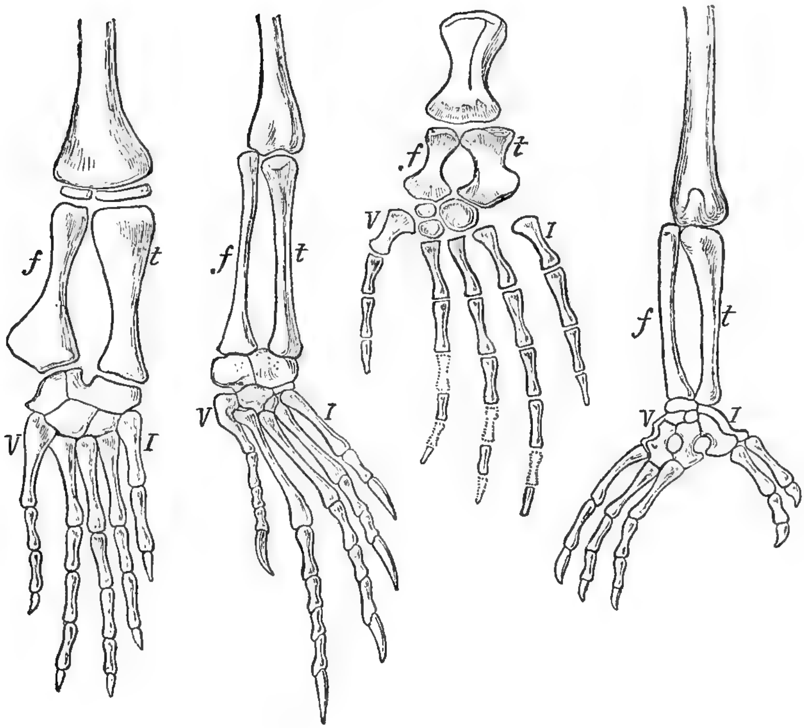
The probable affinities and phylogeny of these five groups are expressed by the following diagram :—

Rhiptoglossa.

Pythonomorpha. *Lacertilia.* *Ophidia.*

Dolichosauria.

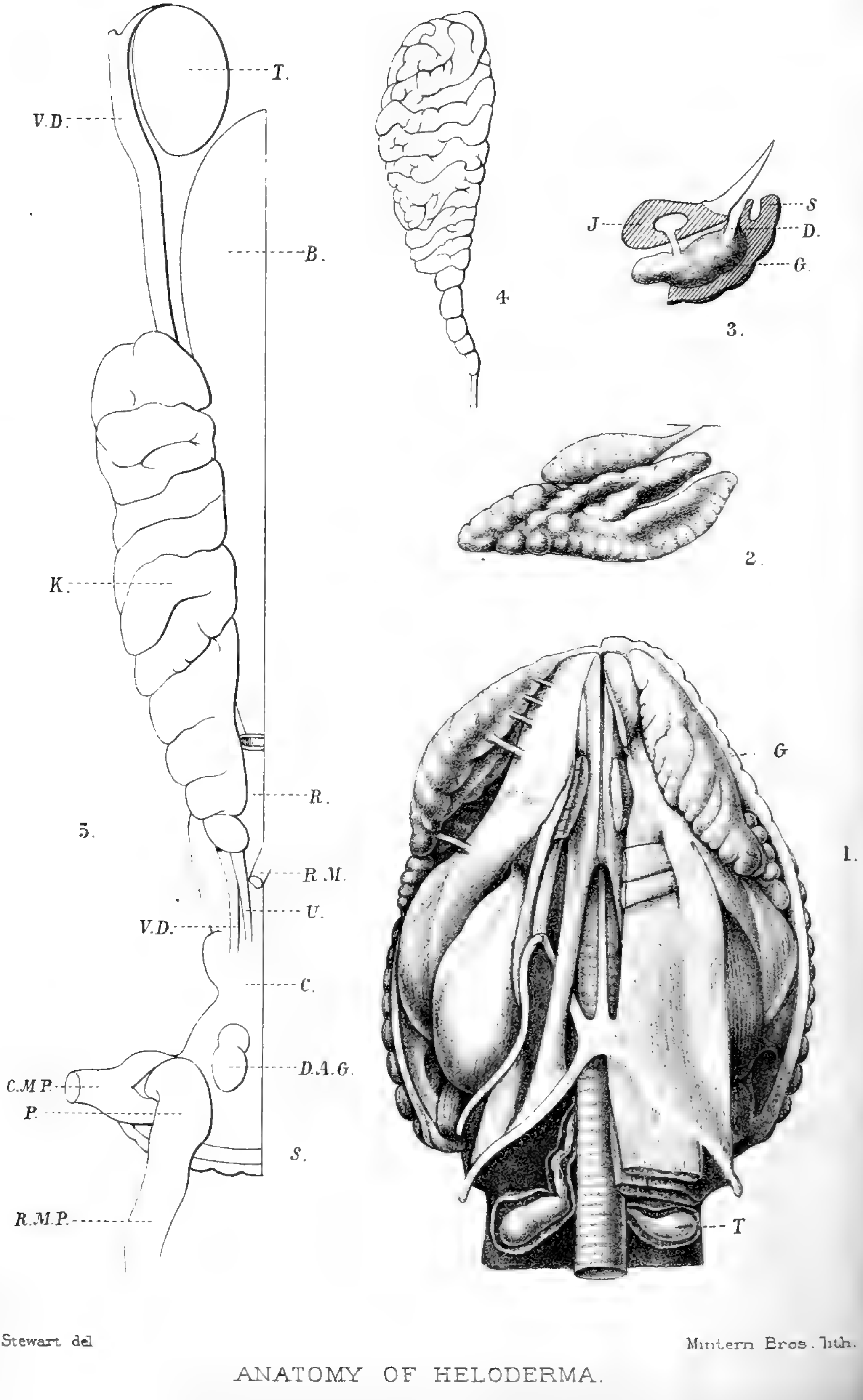
Fig. 6.



A. C. B. D.

A. Hind limb of *Dolichosaurus lesinensis* (after Kornhuber); B. of *Edestosaurus* (after Marsh); C. of *Varanus*; D. of *Chamæleon.*

These figures illustrate the principal modifications of structure of the limbs in the four Suborders in which they are developed.



C. Stewart del. Mintern Bros. lith.

ANATOMY OF HELODERMA.

6. On some Points in the Anatomy of *Heloderma*. By Prof. C. Stewart.

[Received January 20, 1891.]

(Plate XI.)

Having had an opportunity of examining the more or less entire viscera of three specimens of *Heloderma*, viz. a male and female of *H. suspectum*, and one female of *H. horridum*, I have thought that a comparison between them might be of interest, and also that it was desirable to call attention to some features in which my specimens appeared to differ from the recorded observations of others, and to give a brief description of the male urogenital system of *H. suspectum*. Dr. J. G. Fischer, in a paper published in 1878, has given figures and a full account of the poison-apparatus, hyoidean muscles, &c. of *H. horridum*. In the 'Proceedings' of this Society for 1890 is a very complete description of the anatomy of a female specimen of *H. suspectum* by Dr. R. W. Shufeldt.

Thyroid Gland.—The thyroid of *H. suspectum* is figured and described by Dr. Shufeldt as a bilobed structure, the lobes united by a transverse isthmus, and situated in front of the trachea at the base of the heart, but in a footnote (*op. cit.* p. 206) he states that he may have mistaken blood-stained tissue for the thyroid, but that he failed to find anything else which resembled that organ. In all my specimens it was readily found, as a paired organ, the lobes placed one on each side of the trachea and totally unconnected by an isthmus. They were surrounded by a well-defined capsule, to which they were attached by trabeculæ, the capsule apparently forming the walls of a lymph-sinus.

In *H. horridum* the lower border of the thyroid is 47 mm. from the base of the heart, and 73 mm. from the laryngeal opening. The right lobe is 9 mm. long, 5 mm. broad, and $1\frac{1}{2}$ mm. thick. The left lobe is 7 mm. long, with width and thickness the same as the right.

The lower border of the thyroid in the male *H. suspectum* is 46 mm. from the glottis, each lobe was 11 mm. long and $3\frac{1}{2}$ broad; the extremity of the left lobe nearest the trachea was pointed, and from the corresponding end of the right lobe there was a delicate prolongation extending forwards, in length equal to that of the main body of the lobe. In the female *H. suspectum* the thyroid was similar in shape, but somewhat smaller than in *H. horridum*.

Trachea, Larynx, and Lungs.—The length of trachea and larynx from the glottis to bifurcation of bronchi was 110 mm. in *H. horridum*; from bifurcation to point of entrance into lung 13 mm. There were seven large openings from the continuation of the bronchus into the lung-tissue, in front of its posterior termination. They are situated on the ventral surface. Each of the posterior three shows more or less a division into two, a condition more marked in other Lacertilia,

e. g. *Varanus*. The length of the continuation of the bronchus through lung-substance is 55 mm.

The lung is 173 mm. long, the thin-walled rounded posterior end is the larger; anteriorly the lung terminates in a blunt point. Dr. Shufeldt points out that in *Heloderma* the bronchi are long, but that Prof. Mivart states that they are short in Lacertilia. May not this discrepancy be due to the latter anatomist having measured from the bifurcation to the point of their entrance into the lungs, whilst Dr. Shufeldt included the prolongation into lung-substance?

Kidneys.—If the kidneys of the large female *H. horridum* be compared with those of the somewhat small specimen of male *H. suspectum*, one is struck by the relative small size and more numerous lobulation of those of the former. They also show a marked distinction into an oval anterior region, and a tail-like posterior prolongation formed of from four to six small lobules closely adherent to the ureter. In *H. suspectum* the kidney gradually tapers to the posterior extremity. The length of the fore part of the kidney in *H. horridum* was 35 mm.; its breadth 15 mm.; the tail-region 15 mm. long.

In the large male *H. suspectum* the kidney was 70 mm. long and 16 broad.

Genitalia.—The genitalia of the male *H. suspectum* presented the ordinary Lacertilian features. The dorsal wall of the cloaca was provided with a couple of anal glands, whilst a belt of similar though smaller glands surrounded the ventral half of its circumference.

The female *H. suspectum* was much the smaller of the three examples of the genus examined. In it the left ovary contained two nearly ripe ova, the right ovary three; the largest ovum measured 24 mm. by 21 mm.

Inferior labial Poison-glands.—The most interesting feature in the anatomy of *Heloderma* is probably the poison-apparatus figured and described by Fischer and Shufeldt. These both agree in stating that from the surface of each "submaxillary gland" nearest the lower jaw proceed from four to five ducts which pass into the substance of the jaw, and finally discharge the secretion of the gland at the bases of certain of the grooved teeth. This view of the structure I hold to be incorrect, and believe that the gland and its ducts are altogether external to the jaw; that the ducts pass directly from the substance of the gland to their openings, which are situated to the inner side of a fold of mucous membrane which intervenes between the lip and the jaw. In *H. horridum* I only found one opening on either side, a guarded bristle could readily be passed through this into the upper of the three chief lobes of the gland; and on injecting the substance of either lobe by means of a hypodermic syringe, the fluid escaped by this orifice alone.

When the gland of *H. suspectum* was similarly treated, the fluid in like manner freely flowed from all the four or five openings on the mucous surface, without a trace passing into the supposed ducts which went to the jaw, these being in my opinion only the branches of the inferior dental nerve and associated blood-vessels which are normally found in this situation.

The glands have not a smooth surface such as the figures given would indicate, but are divided into well-defined lobules, which in *H. suspectum* converge and partly fuse as they pass upwards and forwards from lower border to the anterior extremity.

Behind the poison-glands are a few small mucous glands.

When dissecting the fresh specimen of *Heloderma* under water, the slightest pressure on the poison-gland caused a milky fluid to escape from the gland-openings referred to above; this fluid readily diffused itself in the water, whereas the mucus from the other glands hung about as more transparent ropy clouds.

EXPLANATION OF PLATE XI.

Fig. 1. Dissection of the ventral surface of the head and neck of *H. suspectum*. G. Left poison-gland; the right gland has been raised to show the branches of the inferior dental nerve and blood-vessels. T. Left lobe of thyroid gland.

2. Inner surface of left poison-gland of *H. horridum*.

3. Diagrammatic section of lower jaw and poison-gland. J. Jaw; G. Gland; D. Its duct; S. Skin.

4. Left kidney of *H. horridum*.

5. Left urogenital system of *H. suspectum*. K. Kidney; B. Bladder; U. Ureter; T. Testis; V.D. Vas deferens; R. Rectum; R.M. Rectal muscles; C. Cloaca; D.A.G. Dorsal anal gland; P. Penis; C.M.P. Constrictor muscle of penis; R.M.P. Retractor muscle of penis; S. Skin.

February 3, 1891.

Prof. Flower, C.B., LL.D., F.R.S., President, in the Chair.

The Secretary read the following report on the additions to the Society's Menagerie during the month of January 1891:—

The total number of registered additions to the Society's Menagerie during the month of January was 76, of which 62 were by presentation, 4 by exchange, 4 by purchase, 1 by birth, and 5 were received on deposit. The total number of departures during the same period, by death and removals, was 71.

Amongst the additions special attention may be called to:—

A Yellow-crowned Penguin (*Eudyptes antipodum*), from New Zealand, presented by Sir Henry Peek, Bart., F.Z.S.

This is a scarce species (*cf.* Buller, B. New Zealand, pl. xlvi. p. 294), and we have never received a specimen of it before.

Mr. Larkworthy, who procured this Penguin for Sir Henry Peek, writes as follows concerning its capture:—"There is an Oyster Fishery established at the Bluff Harbour, Southland, N. Z., and the operations of the fishermen are carried out in the straits between the Middle Island and Stewart's Island. This bird and others, six in all, were captured by the crew of one of the oyster-boats, in one of the small bays in Stewart's Island, and sent thence to Port Chalmers, Otago, to wait for a steamer."

A letter was read from Dr. Emin Pasha, C.M.Z.S., dated Bussisi (on Lake Victoria Nyanza), October 6, 1890, announcing the despatch to the Society of a collection of Birds which he had made on his way up from the coast.

The Secretary exhibited, on behalf of Mr. J. W. Willis-Bund, F.Z.S., a specimen of the Collared Petrel (*Œstrelata torquata*, Macg.), which had been shot off the Welsh coast in Cardigan Bay in December 1889, as recorded in the 'Zoologist' for 1890 (p. 454).

This was the first instance of the occurrence of this South-Pacific species in the British seas.

The following papers were read:—

1. On the Question of Saurognathism of the Pici, and other Osteological Notes upon that Group. By R. W. Shufeldt, C.M.Z.S. &c.

[Received January 9, 1891.]

For a number of years past the doubt has been growing in my mind as to the correctness of the interpretation placed upon the osseous structures at the base of the skull in the *Pici* by three morphologists who are the upholders of the idea of a state of saurognathism in these birds. This doubt has been strengthened during these years by many studies of the anatomy of Woodpeckers in all stages of growth and of many species. Within the past year the osteology of all the United States genera of this group in numerous cases, including skeletons of adults, subadults, and nestlings, has been carefully reviewed by me upon ample material. This last investigation has confirmed my doubts.

Of all those ornithotomists of authority who have made researches in this direction, the opinions of but three shall be adverted to here, and references will be made to Huxley, Parker, and Garrod.

No blame is attached to that host of most capable systematic ornithologists who, never having dissected a Woodpecker in their lives, have in their published works more or less blindly adopted the views of those who have relegated the *Pici* to a saurognathous group created to contain them. As is well-known, among the more recent interpreters of the structures exemplified on the part of birds, Professor Huxley, in his remarkable paper which appeared in the Proceedings of this Society for 1867 on the Classification of Birds, presented the results of some of his studies of the cranial peculiarities seen among the Woodpeckers. And so impressed was he with the apparently unique condition of certain osseous structures seen at the cranial base in these forms, that he suggested a separate group for the *Pici*, viz. the *Celeomorphæ*.

But in characterizing this group, he was, from an insufficient supply of material, led into several errors,—errors of omission and errors of commission,—which have since been appreciated by the avian morphologist. Professor Huxley held that in the Woodpeckers "the vomers are very delicate rod-like bones, which in some cases, at any rate, remain permanently separate." It will be observed that he makes no reference to that median bone which is seen to lie between the palatines in some species, and which Parker afterwards designated as the "medio-palatine."

It would be superfluous for me to enter upon the question here of the enormous, and upon the whole beneficial, influence this masterly and opportune memoir has had upon the study of avian structure and taxonomy.

Later on Professor Garrod called into question the conception of these parts as arrived at by Professor Huxley [1].

Garrod remarked that "Professor Huxley, in his paper 'On the Classification of Birds,' has entered into considerable detail respecting the Woodpecker's palate, and from not finding a vomer present, and observing the peculiar longitudinal bony spicula connected with the inner edges of the palatine bones, opposite to and behind the fenestræ they assist to enclose, is led to think that these spicula are the rudiments of the vomer, which has not ossified across the middle line. But in carefully prepared skulls they look much more like the inner edges of the imperfectly ossified palatines, as they are connected completely with them at both ends. Further, in most of the specimens of *Gecinus viridis* and its allies that I have had the opportunity of examining, I have found a median bone, situated between the palatines, and supported like a vomer on the basisphenoid rostrum, at the anterior end of its broader portion. This bone is small, and shaped very much like a spear-head with the tip directed forwards, whilst posteriorly it gradually becomes fibrous and tends to bifurcate, but not in the ossified part. It does not extend backwards quite so far as the pterygo-palatine articulation."

It is evident that Garrod saw the *vomer* of the *Pici* in the median bone which Professor Huxley had overlooked, and construed the spicula given off by the palatine bones, *not* as vomers, but as palatine spurs of processes.

Next appears the beautiful monograph of Professor W. Kitchen Parker, entitled "On the Morphology of the Skull in the Woodpeckers (Picidæ) and Wrynecks (Yungidæ)," which was read before the Linnean Society of London in April 1874. It is illustrated by five superb 4to plates coloured, giving enlarged views of the skulls of several Woodpeckers, *Iynx*, &c. In this work Professor Parker essentially adopted the views of Huxley in the premisses and amplified them. The saurognathism of the *Pici*, however, evidently still had its doubters and opponents, for in the work just quoted Professor Parker

[1] Garrod, A. W., "Note on some of the Cranial Peculiarities of the Woodpeckers," Ibis, 1872, pp. 357–60, October 1.

is constrained to say that, "Thus in the large series of types which I have determined to compare together, it has seemed fit to me to take a very small territory; yet that territory contains parts that have undergone the greatest amount of metamorphosis of any in the whole body of a high and noble vertebrate, and moreover being, in the bird, the skeletal framework of the whole upper face, these parts are, as it were, an index of the amount of specialization undergone by any particular type—the ruling determining structures that lead to all, and really demand all, the changes that take place in the rest of the organism. This is especially explained for the benefit of those who will accuse me, and have already accused Professor Huxley, of taking a narrow view of the Bird-types—touching with the point of a needle some little tract, but unacquainted with and not able to appreciate the Bird as a *whole*."

After long thought and, as stated above, after many dissections of Woodpeckers of various genera, the writer is led to believe in regard to this question that—(1) The Pici are peculiar in regard to certain osseous structures of the cranium, *but* inasmuch as *all* the rest of their organization exhibits a high order of specialization, nearly equalling some of the *highest* among *birds*, these few characters must not be considered as being the representatives of the corresponding parts, in structure and arrangement, as found among some Lizards. We have abundant evidence of the Reptilian origin of birds without damaging this evidence by straining such points as these.

(2) That inasmuch as the *vomer* in *all* adult birds, even in the Ostrich-types, is single and *median*, the "medio-palatine" of Parker must be considered the *vomer* of the *Pici*. And when other small, median ossifications are found along in the line of the vomer, when the latter is present, they are simply adventitious ossicles occurring in the soft, membranous medio-septa of these vertebrates; such structures are occasionally seen in certain Hawks and Owls.

(3) That the processes designated as the *vomers* of the *Pici* by Professor Parker are merely apophysial outgrowths of the mesial borders of the palatines, and as the palatines are paired bones in Aves, we cannot conceive of such a structure in them as a "medio-palatine."

(4) That they are not desmognathous means nothing in a saurian sense, for even among the so-called Desmognathæ, *Elanus* is a *non*-desmognathous bird; and that the "maxillo-palatines" are but little developed in the *Pici*, applies also with almost equal truth to the *Trochili*, where we find them much reduced.

(5) That the fact that the basipterygoid processes are arrested would not especially entitle them to be called a saurognathous group. We see the same in some *Accipitres*, and they are functional in the Owls and other highly organized birds.

(6) That we do not believe that the *pterygoid* of a Woodpecker in any way especially answers to that bone in a Snake or a Lizard, any more than does the pterygoid of any other highly specialized bird. And further, that some of the peculiarities of the *Pici* may be due to the fact that these birds have long used their bills to strike

heavily with, which in time may have come to modify certain structures of the cranium, as has been pointed out by Garrod [1].

(7) It is quite characteristic of many of the skulls in the *Pici* that some of the free margins of the cranial bones, during the growth of the species, are prone to ossify by what may be designated as a "ragged border," and this will account for the minute granular islets of bone which occur along the mesial margins of the palatines; they are the so-called "septo-maxillaries" of Parker,—but they really belong to the palatines. We have found them to *vary* greatly in *number*, and in *position* in the same species. They are likewise adventitious ossifications, and they belong to the same category as the "Wormian bones" of anthropotomy.

(8) Finally, as to the nasal labyrinth, we find nothing especially saurian beyond what we see in other highly specialized types of birds. Parker has said in the article "Birds" of the 'Encyclopædia Britannica' (9th ed. p. 717), that "these birds are saurognathous in other respects, *e. g.*, their nasal labyrinth is unusually simple. The 'inferior turbinal,' which has three coils in *Rhea* and *Tinamus*, and *two* in most birds, is in *Gecinus* merely bi-alate; in *Iynx* it makes less than a single turn, whilst the alinasal turbinal of that bird has two turns, and that of *Gecinus* one. *Gecinus* is in all respects the most specialized, *Picumnus* the most embryonic, and *Iynx* the most passerine of the *Celeomorphæ*. Also, in *Gecinus* the nasal labyrinth is most ossified, and in *Iynx* least."

This strikes us as rather peculiar logic when arguing for the saurian organization of certain cranial structures as seen in the *Pici*: especially when we come to recognize the relative position of *Rhea* in the system, and the high position held by the *Passeres*.

Indeed, we must believe that too close study of a single set of characters stands in danger of making us blind to the significance of the *tout ensemble* of the characters presented on the part of the entire economy of the form examined.

In his Linnean paper quoted above, Professor Parker says of *Picumnus minutus* that "I have had to work out the parts of this bird's palate from the fractured skull in a *dry skin*." His entire knowledge of the structures of this interesting genus of birds probably rested upon this examination. It is evident, then, what we most need now in this direction is a full description of the *entire* structure of several genera of the *Pici*, with the same for *Iynx* and *Picumnus*, and these thoroughly compared with several of the *Cotingidæ* and *Formicariidæ* and allied forms.

As I have already remarked on a foregoing page, I have recently examined series of skeletons of many species of Woodpeckers found in the United States. The results of these investigations have been written out to form one of the chapters of my work upon the Osteology of Birds of this country. Two sections terminate the chapter and they are herewith presented in advance of the publication for which they were written.

[1] Coll. Sci. Memoirs, p. 117.

Summary of the chief Osteological Characters of the North-American Pici.

1. Large, but simple-scrolled turbinals; there may be a free turbinal.

2. Bulging of the frontal region over the transverse cranio-facial line may (*Picoides*) or may not (*Colaptes*) exist.

3. Generally the external cranial vault is more or less dinted by the ends of the quills of the capital feathers.

4. The interorbital septum is sometimes entire and sometimes shows a fenestra.

5. Pars plana large, and often the *os uncinatum* is well-developed.

6. Lacrymal usually vestigial in character.

7. Quadrato-jugal aborted.

8. Tympanic bullæ cowrie-shell shaped, and otherwise peculiar.

9. A large spur on the upper side of either pterygoid for muscular attachment.

10. A median, dagger-shaped vomer sometimes present but sometimes absent.

11. Maxillo-palatines rounded, laminar and very much aborted.

12. A more or less imperfect nasal septum usually present.

13. Vestigial basipterygoid processes are distinctly developed in some species.

14. As ossification advances in the palatines it may be characterized as being "ragged" along the antero-mesial and antero-external margins of these bones. This often leaves little osseous islets not absorbed, a few of which may persist here and there throughout the life of the individual.

15. Either palatine is characterized by possessing an "interpalatine spine" or process, and this may be continued forwards to fuse with the mesial border of the bone by its free tip. Either palatine also possesses a *palatine spur*, springing from the anterior point of the internal lamina of the bone and being directed forwards. It may also in some species pass on to fuse with the mesial edge of the palatine to which it belongs by its free end. The postero-external angle of a palatine is either truncated or shows various degrees of being bluntly rounded.

16. The mesopterygoid process of a pterygoid is not paddle-shaped, but long and narrowly pointed.

17. Distinct orbito-sphenoids exist in the nestling.

18. Mandible very strong, typically V-shaped in pattern; sides deep; symphysis varies in depth; ramal vacuity absent, or minute if present, and never large. Posterior angular processes more or less truncated; internal angular processes large. In some species the posterior third of the inferior ramal border somewhat tumefied and roughened.

19. Rudimentary cerato-hyals which early fuse together.

20. Uro-hyal absent.

21. Elongated thyro-hyal elements curl up over the cranium to a greater or less extent. They may pass round the right orbit.

They may come to the posterior margin of the right external narial aperture. They may hardly come up on the cranium at all. Whenever they do, the cranium is usually externally furrowed to receive them.

22. Sclerotal plates of the eye commonly fuse completely together around their external periphery and towards the centre.

23. "Double 'infrastapedial' and ossified stylohyal" (Parker).

24. Rings, semirings, and other parts of the trachea ossify.

25. There are 19 free vertebræ between the skull and pelvis: the vertebrarterial canals pierce the atlas, and in some species the axis; the atlantal cup is perforate; there are no parial parapophyses; the carotid canal may or may not be entirely closed in by bone; where they are present the neural and hæmal spines are usually very large.

There are three pairs of cervical ribs, five pairs of dorsal ribs, and one pair of sacral ribs. The hæmapophyses of the latter do not reach the sternum. In some species the first pair of costal ribs are very robust, as are the last pair of cervical ones. There are five or usually six tail-vertebræ (free), with an enormous pygostyle. Most of these parts are highly pneumatic.

26. The sternum is 2-notched on either side of the carina; the manubrium is either slightly or very much bifurcated; the costal processes are long and pointed, and the keel is usually rather shallow, projecting forwards and carried up under the manubrial process. The sternum is usually completely pneumatic.

27. In the pelvis we find the ilia gradually diverging from the sacral crista as they pass forwards. Parial interdiapophysial foramina are either very minute or entirely absent. Ischial notch on the posterior margin of the bone long, rounded, and shallow. Acetabulæ large, and bases completely absorbed. Sides of pelvis usually very deep. Postpubis slender, extends beyond ischium, the foot of which latter may or may not fuse with it. Obturator space large, and may or may not merge with the obturator foramen. *Three* of the vertebræ of the sacrum anteriorly throw out their processes against the ventral iliac walls. The pleurapophysial and transverse processes of the sacral vertebræ opposite the acetabulæ are not modified and lengthened so as to act as braces at the points in question. The pelvis is commonly completely pneumatic.

28. Bones of the shoulder-girdle pneumatic, with the exception (sometimes) of the furcula. This latter is of the U-shaped pattern, without hypocleidium, large, flat scapulo-coracoid ends (which originate from separate ossific centres in the young), and with laterally compressed limbs. Posterior end of scapula more or less modified to be bent or to curl outwards, giving the bone a very unique form. Coracoids long, not very stout, and with the anterior end more or less laterally compressed.

29. An *os humero-scapulare* present at either shoulder-joint; functional, and has much the same shape as the ossicle has in the *Passeres.*

30. Either the humerus alone, or it together with the long bones of the antibrachium, may be pneumatic. A small sesamoid is found at

the elbow. Seven prominent osseous papillæ occur at nearly equal distances apart down the shaft of the ulna. The flat, rounded process from the postero-upper third of the shaft of index metacarpal is present. The slender last metacarpal extends below the one of index, and its free digital joint is *larger* than either of the other terminal phalanges. The proximal phalanx of index digit has its posterior blade almost entirely aborted. There are no claws.

31. Femur is always pneumatic, and so may be the tibio-tarsus in some species. In the former the trochanter major does not rise above the summit of the shaft; the excavation on the head is very shallow. Shaft nearly straight; condyles rather small; popliteal fossa and rotular channe very shallow. *Pici* possess patellæ. Cnemial crest of tibio-tarsus elevated above summit of bone, with pro- and ecto-cnemial ridges nearly or quite aborted. Condyles of this bone very distinct, and intercondyloid valley very deep. Bony bridgelet confines tendons in front. Fibula short and free, its lower spicula-like end being held well away from shaft of tibio-tarsus by the increasing height of fibular ridge on the latter bone.

Hypotarsus of tarso-metatarsus both grooved and perforated for passage of tendons. An erect process occurs on the summit of this bone of the leg. Its shaft is nearly straight, and its terminal trochleæ are specially modified to meet the podal requirements of the picine zygodactyle foot.

Joints of pes normal, 2, 3, 4, and 5 to the first, second, third, and fourth toes respectively. Fourth toe permanently reversed, and first toe, together with its free metatarsal bone, may be entirely absent (*Picoides*). A larger sesamoid articulates with a special trochlea (intended for it) to the inner side of the fourth toe. The osseous claws usually large, and the other phalangeal joints more or less laterally compressed. The tendons of the leg sometimes ossify to a certain degree, and minute sesamoids may occur in certain tendons near the knee-joint.

Brief Remarks on the probable position of the Pici *in the System, and on their Affines.*

Huxley in his "Celeomorphæ" comprehended only the *Picidæ* and *Iyngidæ,* and Parker long ago said that "the 'Celeomorphæ' of Huxley form a most natural and well-defined group—a group equal, zoologically, to the Pigeons or the Parrots. Evidently this differentiation has taken place through the gradual extinction, during long secular periods, of conjugational types more generalized than those now extant." In this much the present writer agrees with the two great authorities we have just quoted.

To those at all familiar with the osteology of existing birds it must be very evident that in an anatomical system, at least, the *Pici* hold many characters in common with the *Passeres,* a fact that will be evident when we come to treat of that group later on. It is my opinion that it is to the great Passerine group that the *Pici* are more

J. Smit lith. Hanhart imp.

PLATYCERCUS ERYTHROPEPLUS, ♂, ♀.

nearly allied than to any other existing suborder of birds. One good genus of linking forms, at least, is the South-American *Picumnus*, as Parker has already shown; and Parker believed that the *Pici* "have a Passerine foundation."

I here venture to state that as our knowledge of the morphology of Aves becomes more perfect, the fact will be appreciated that the *Pici* and the *Passeres* are divergent groups from a common stock in time; and that the former have simply become highly specialized and modified in accordance with their mode of life and habits. This common stock Fürbringer has referred to as the 'Pico-Passeriformes,' and the root-stock just prior to the divergence the 'Pico-Passeres,' which latter he again subdivides into his families. This also appears to be in keeping with our present knowledge of the subject, and what the osteology of the groups in question seems to indicate.

2. Descriptions of two new Species of Parrots of the Genus *Platycercus*. By T. Salvadori, C.M.Z.S.

[Received February 2, 1891.]

(Plate XII.)

1. Platycercus xanthogenys, sp. nov.

Head, sides of the neck, and all the under surface dull scarlet; the feathers of the breast and abdomen with narrow pale yellow edges; cheeks pale yellow; feathers of the nape and back black, bordered with red; feathers of the rump and upper tail-coverts also black, broadly margined with olive-grey, the longest upper tail-coverts stained with red at the tip; a black patch on the upper wing-coverts, the exterior ones from the bend of the wing down to the primary-coverts and also the base of the outer webs of the primaries blue; inner greater wing-coverts and inner secondaries with grey edges, stained with yellowish or reddish; under wing-coverts blue; quills underneath black; sides of the body tinged with yellowish; thighs grey; central tail-feathers dull blue, the next pair of tail-feathers blue, brighter on the outer webs and tipped with white, the remaining tail-feathers light blue tipped with white and with the basal portion deep blue; bill horn-colour; feet brown. Total length 12·5 inches, wing 5·45, tail 6, bill 0·56, tarsus 0·63.

Hab. Unrecorded, but no doubt Australia.

This species is nearly allied to *P. icterotis* (Temm.), from which it differs in being larger and in having the cheeks of a paler yellow, the feathers of the back edged with red, the rump-feathers and upper tail-coverts edged with greyish olive, and the central tail-feathers blue, with no green. There are also other minor differences.

The type of this species, formerly in Gould's collection, is now in the British Museum; unfortunately it has no original label.

2. Platycercus erythropeplus, sp. nov. (Plate XII.)

Male? Head, neck, and lower parts red; cheeks blue, whitish near the lower mandible; feathers of the upper part of the back black with dark red edges, as in *P. pennanti* (Lath.); scapulars black, edged with pale yellow and tipped with red; lower back and rump greenish yellow, each feather edged with red; the red feathers of the breast and abdomen with yellow bases; middle of the abdomen and flanks yellow, with the edges of the feathers red; wings as in *P. eximius*; a black patch on the upper wing-coverts; edge of the wing and outer wing-coverts blue, the inner median and greater wing-coverts black, with a green longitudinal stripe inside the yellowish edges; primaries and anterior secondaries black, edged with blue near the base; inner secondaries black, edged with yellow and green; central tail-feathers green, passing into bluish at the tip, the remainder of the tail-feathers dark blue at the base, passing into light blue on the median part and white at the tip; bill whitish horn-colour; naked skin round the eyes and feet dusky flesh-colour; iris black. Size of *P. pennanti.*

Female? Similar to the male, only smaller and with the yellow colour on the sides of the breast and flanks more extended.

Hab. Australia.

These descriptions are taken from two specimens, apparently male and female, now living in the Society's Gardens, which were bought from a dealer, as from S. Australia.

They are intermediate between *P. pennanti* and *P. eximius*, and on examining them one cannot help thinking that they may be hybrids of the two species mentioned. But as cases of hybridism in wild birds are very rare, it becomes highly improbable that two hybrids should have been bought together, so that, I think, I am justified in considering them as belonging to a new species, intermediate, as I have already stated, between *P. pennanti* and *P. eximius.*

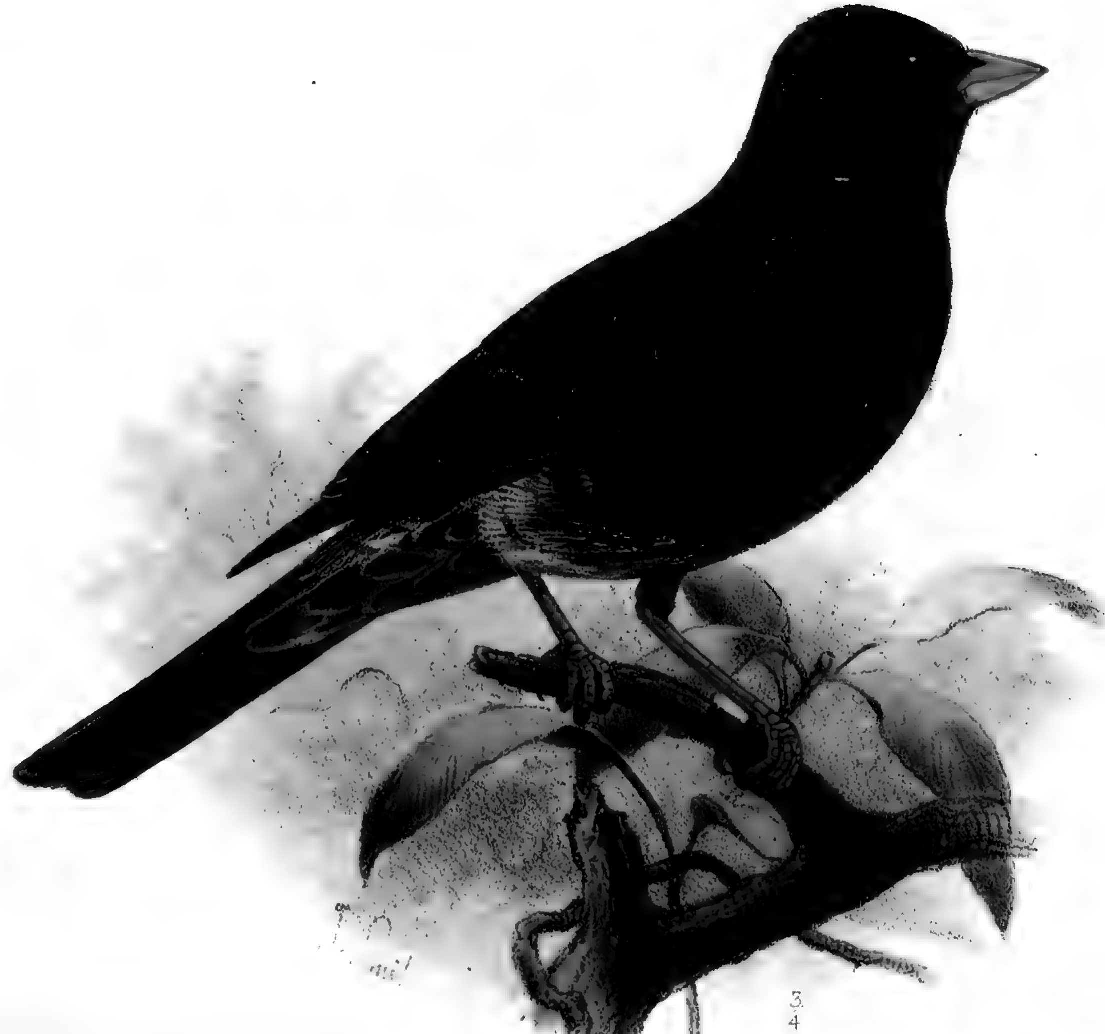
The following are the leading points of distinction:—

The red colour of the head and breast is, like that of *P. eximius*, a little brighter than in *P. pennanti.*

The feathers of the upper parts have broad red edges as in *P. pennanti*, while the scapulars are edged with pale yellow as in *P. eximius*, but tipped with red.

The red colour predominant on the underparts associates the new species with *P. pennanti*, but at the same time the yellow bases of the feathers of the breast and abdomen show a certain degree of affinity to *P. eximius.*

The yellow colour also in the middle of the abdomen and on the flanks and the two green central tail-feathers, passing into blue at the tip, betray affinity with *P. eximius.*



J. Smit lith

Hanhart imp

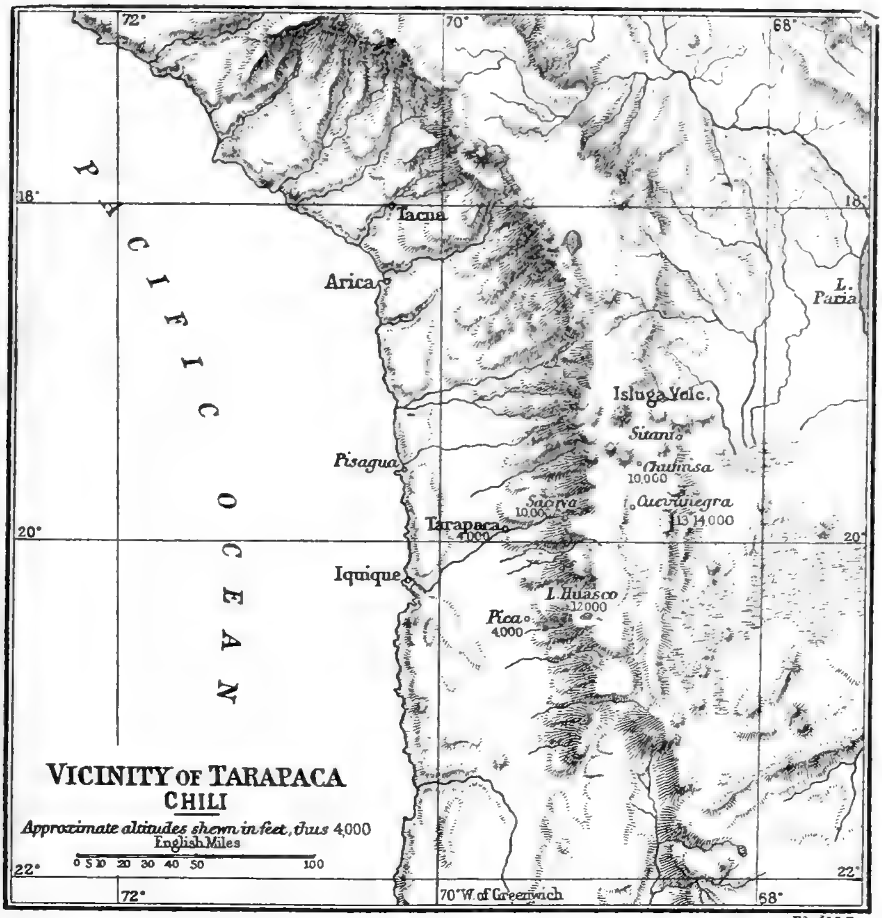
PHRYGILUS CORACINUS.

3. On a second Collection of Birds from the Province of Tarapacá, Northern Chili. By P. L. Sclater, M.A., Ph.D., F.R.S., Secretary to the Society.

[Received January 30, 1891.]

(Plate XIII.)

Mr. H. Berkeley James, F.Z.S., has placed in my hands for determination a second collection of birds from Tarapacá, made for him by Mr. Ambrose A. Lane in 1890. The series embraces altogether about 150 skins, referable to 53 species. Most of the



Edwd Weller.

species are, as might have been expected, the same as those obtained by Mr. C. Rahmer in the same district, of which I gave an account to the Society in 1886[1]. But there are 21 species represented in

[1] See P. Z. S. 1886, p. 393.

the present collection which were not in Mr. Rahmer's series, and one which is apparently new to science.

It appears from Mr. Lane's letters that he made two excursions from San Pablo, a station on the Nitrates' Railway, into the Cordilleras of Tarapacá, one in January 1890 and the other in March and April. The principal localities visited were Pica (alt. 4000 ft.), Lake Huasco (alt. 12,000), and Sacaya (alt. 10,000), all marked in the map attached to my paper on the previous collection from the same district, which I now exhibit (see p. 131).

The only additional information given concerning the Avifauna of Tarapacá since the publication of my previous communication on this subject is contained in the short paper on the birds of the Desert of Atacama and the Province of Tarapacá by Dr. R. A. Philippi, published in 'Ornis' for 1888 ('Ornis,' vol. iv. p. 155). In this paper Dr. Philippi gives a nominal list of 80 species of birds collected during a scientific expedition sent by the Chilian Government into the provinces of Antofagasta and Tarapacá in 1884. The leader of the expedition was Prof. Friedrich Philippi, and the collector was Carl Rahmer, who subsequently procured for Mr. James the birds from Tarapacá which I described in my previous paper. Dr. Philippi gives 80 species in his list; but it embraces many species of Antofagasta and the coast, and does not materially add to our knowledge of the avifauna of Tarapacá.

On the whole we may say that this new portion of the Chilian Republic has brought a considerable admixture of Bolivian and Peruvian species into the Chilian Avifauna, as is shown by the occurrence in it of such species as the following, which are mentioned in this or in my preceding paper, but which were previously unknown to the list of Chilian birds:—

1. Turdus chiguanco.
2. Atticora cinerea.
3. Conirostrum cinereum.
4. Phrygilus atriceps.
5. Phrygilus coracinus.
6. Xenospingus concolor.
7. Chrysomitris atrata.
8. Centrites oreas.
9. Geositta frobeni.
10. Upucerthia jelskii.
11. Cinclodes bifasciatus.
12. Colaptes rupicola.
13. Bolborhynchus orbignesius.
14. Phœnicopterus jamesi.
15. Querquedula puna.
16. Chamæpelia cruziana.
17. Fulica gigantea.
18. Recurvirostra andina.
19. Tinamotis pentlandi.
20. Rhea darwini.

Of these it should be mentioned *Phrygilus coracinus*, *Phœnicopterus jamesi*, and *Recurvirostra andina* have not yet, so far as I am aware, been met with outside of Tarapacá and the adjoining new provinces of Chili, but will almost certainly be found to occur also in the neighbouring districts of Bolivia.

1. ATTICORA CINEREA (Gm.).

Atticora cinerea, Sharpe, Cat. B. x. p. 184.

Sacaya.

This is an addition to the list of Tarapacan birds. Examples of it were obtained by Whitely at several localities in the province of Arequipa, Peru.

2. Conirostrum cinereum, d'Orb. et Lafr.

Conirostrum cinereum, Scl. Cat. B. xi. p. 15.

Pica.

Also new to the list, and obtained by Whitely near Arequipa. See remarks on the range of this species, 'Ibis,' 1880, p. 31. D'Orbigny met with the original specimens of this bird in the ravines of Tacna, now within the frontiers of Chili.

3. Zonotrichia pileata (Müll.).

Zonotrichia pileata, Sharpe, Cat. B. xii. p. 611.

Pica.

One of the most widely spread birds in South America, also obtained by Whitely near Arequipa, but an addition to the present list.

4. Pseudochloris aureiventris (Phil. et Landb.).

Sycalis aureiventris, Scl. P. Z. S. 1886, p. 397.

Pseudochloris aureiventris, Sharpe, Cat. B. xii. p. 777.

Sacaya.

5. Phrygilus atriceps (d'Orb. et Lafr.).

Phrygilus atriceps, Scl. P. Z. S. 1886, p. 397; Sharpe, Cat. B. xii. p. 786.

Sacaya.

6. Phrygilus coracinus, sp. nov. (Plate XIII.)

Supra obscure niger, uropygii et dorsi inferioris plumis cinereo mixtis; alis caudaque nigris, tectricum alarum marginibus angustissimis albis: subtus niger, hypochondriis in cinereum trahentibus; crisso nigro, plumis albo marginatis: rostro flavo; pedibus rubris: long. tota 7·4 poll. Angl., alæ 4·0, caudæ 3·2, tarsi 1·0.

Hab. Chiliæ prov. Tarapacá.

Obs. Affinis *P. fruticeti*, sed capite et dorso unicolore nigris distinguendus.

Two specimens of this bird are in the collection, both obtained at an Estancia eight leagues from Sacaya, on the 20th March, 1890, and marked as males. The second specimen is not quite in such full plumage as the one described, and shows more cinereous colour on the back and belly.

The species is obviously nearly allied to *P. fruticeti*, but at once recognizable by its much blacker coloration.

7. Xenospingus concolor (d'Orb. et Lafr.).

Xenospingus concolor, Sharpe, Cat. B. xii. p. 799.

Five examples of both sexes from Pica.

This remarkable Fringilline bird was discovered by d'Orbigny near Arica, rather further north. Whitely obtained specimens of it in the province of Arequipa (see P. Z. S. 1868, p. 174).

8. CHRYSOMITRIS ATRATA (d'Orb. et Lafr.).

Chrysomitris atrata, Scl. P. Z. S. 1886, p. 397; Sharpe, Cat. B. xii. p. 212.

Sacaya and Lake of Huasco.

9. AGRIORNIS MARITIMA (d'Orb. et Lafr.).

Agriornis maritima, Scl. Cat. B. xiv. p. 6.

Sacaya.

New to Tarapacá, but a well-known Chilian species. Obtained by Rahmer in Antofagasta ('Ornis,' 1888, p. 154).

10. MUSCISAXICOLA ALBIFRONS (Tsch.).

Muscisaxicola albifrons, Scl. P. Z. S. 1886, p. 397; id. Cat. B. xiv. p. 54.

Sacaya.

11. MUSCISAXICOLA RUFIVERTEX, d'Orb. et Lafr.

Muscisaxicola rufivertex, Scl. P. Z. S. 1886, p. 398; id. Cat. B. xiv. p. 58.

San Pablo and Sacaya.

12. ELAINEA ALBICEPS (d'Orb. et Lafr.).

Elainea albiceps, Scl. Cat. B. xiv. p. 141.

Pica.

Of wide distribution in the Patagonian Subregion, but not included in my former list.

13. GEOSITTA FROBENI, Phil. et Landb.

Geositta cunicularia, Scl. P. Z. S. 1886, p. 398.
Geositta frobeni, Scl. Cat. B. xv. p. 6.

Sacaya.

14. UPUCERTHIA JELSKII, Cab.

Upucerthia jelskii, Scl. Cat. B. xv. p. 18.

Sacaya.

This is an addition to the list, but might well be expected to occur here, as it was obtained by Jelski in Central Peru, and by Bridges in Bolivia.

15. CINCLODES FUSCUS, Vieill.

Cinclodes fuscus, Scl. P. Z. S. 1886, p. 398; id. Cat. B. xv. p. 23.

Sacaya.

16. CINCLODES BIFASCIATUS, Scl.

Cinclodes bifasciatus, Scl. P. Z. S. 1886, p. 398; id. Cat. B. xv. p. 25.

Sacaya.

17. LEPTASTHENURA ÆGITHALOIDES (Kittl.).

Leptasthenura ægithaloides, Scl. P. Z. S. 1886, p. 398; id. Cat. B. xv. p. 35.

Sacaya.

18. SIPTORNIS MODESTA (Eyton).

Siptornis modesta, Scl. Cat. A. B. xv. p. 66.

Sacaya.

This is a well-known Chilian and Argentine species, but new to the avifauna of Tarapacá.

19. COLAPTES RUPICOLA, d'Orb. et Lafr.

Colaptes rupicola, Harg. Cat. B. xviii. p. 26.

Yrpa, near Uzilugo, 11. 4. 90.

A single female, which shows no traces of crimson on the nape, and therefore, I suppose, belongs to *C. rupicola*, and not to *C. puna* (Harg. *op. cit.* p. 27), if these two species are really different.

20. BOLBORHYNCHUS ORBIGNESIUS (Bp.).

Bolborhynchus orbignesius, Scl. P. Z. S. 1886, p. 399.

Sacaya.

21. BUBO VIRGINIANUS (Gm.).

Bubo virginianus, Scl. et Huds. Arg. Orn. ii. p. 50.

Vilugo.

22. SPEOTYTO CUNICULARIA.

Speotyto cunicularia, Scl. et Huds. Arg. Orn. ii. p. 52.

Canchosa and Sacaya.

These two Owls are not included in my former list, but are both widely distributed over America.

23. BUTEO ERYTHRONOTUS (King).

Buteo erythronotus, Scl. P. Z. S. 1886, p. 399.

Sacaya and Canchosa.

24. FALCO FUSCO-CÆRULESCENS, Vieill.

Falco fusco-cærulescens, Scl. et Huds. Arg. Orn. ii. p. 69.

Vilugo.

New to this district, but of wide distribution in South America.

25. MILVAGO MEGALOPTERUS (Meyen).

Milvago megalopterus, Scl. P. Z. S. 1886, p. 399.

Sacaya.

26. ARDEA EGRETTA (Gm.).

27. ARDEA CANDIDISSIMA, Gm.

28. Nycticorax obscurus, Bp.

Examples of these three Herons from Sacaya.
Only *A. candidissima* was in the former list.

29. Phœnicopterus andinus, Philippi.

Several examples of this Flamingo from the salt-marshes of Canchosa.

Mr. Lane did not meet with *Ph. jamesi* (P. Z. S. 1886, p. 399, pl. xxxvi.), which probably only occurs at still higher altitudes, and writes that he could obtain no intelligence of it.

I observe that Dr. Philippi includes two Flamingoes in his list ('Ornis,' 1888, p. 160), but calls the second species *P. ignipalliatus*.

30. Bernicla melanoptera, Eyton.

Sacaya. Adult and young.

"The Andean Goose builds in holes in banks or cliffs. I had rather a job taking its nest. I lowered myself with a rope, and hung for nearly an hour and a half before I could get at it. The wind was so high and the dust so bad I could not see. The nest and eggs were beyond my reach in a slight hollow; however, after some time I raked them out."—A. A. L. *in litt.*

31. Querquedula cyanoptera (Vieill.).

32. Querquedula oxyptera (Meyen).

33. Querquedula puna (Tsch.).

34. Dafila spinicauda (Vieill.).

Examples of these four Ducks from Sacaya.

35. Chamæpelia cruziana (d'Orb.).

Pica.

36. Rallus rhytorhynchus, Vieill.

Rallus rytorhynchus, Scl. et Huds. Arg. Orn. ii. p. 149.

Pica.

This Rail is found in Argentina, Chili, and Patagonia, but is not in the former list.

37. Gallinula galeata (Licht.).

Sacaya.

38. Fulica gigantea, Eyd. et Soul.

39. Fulica ardesiaca, Tsch.

Examples of these two Coots from Sacaya.

40. Vanellus resplendens (Tsch.).

41. ÆGIALITIS OCCIDENTALIS, Cab.

Both these Plovers were included in Herr Rahmer's series. Examples were obtained near Sacaya.

42. ATTAGIS GAYI, Less.

A single example of this bird obtained "three leagues south-west of Sacaya." The species is not in the former list.

43. THINOCORUS RUMICIVORUS, Eschsch.

One example from La Noria (2. 6. 90). This species is not in the former list.

44. THINOCORUS ORBIGNYANUS, Less.

Sacaya, Lake Huasco, and Canchosa. See P. Z. S. 1886, p. 403.

45. RECURVIROSTRA ANDINA, Ph. et Landb.

Sacaya and Lake of Huasco.

46. TRINGA MACULATA, Vieill.

47. TRINGA BAIRDI, Coues.

48. TOTANUS FLAVIPES.

49. GALLINAGO PARAGUAIÆ (Vieill.).

Examples of these four Waders from Sacaya. The last was not in the former list.

50. LARUS SERRANUS, Tsch.

Sacaya and Lake of Huasco.

51. PODICEPS CALIPARÆUS, Less.

Podiceps caliparæus, Scl. et Huds. Arg. Orn. ii. p. 204; Philippi, Ornis, 1888, p. 160.

A specimen of this Grebe in immature or winter dress from the Lake of Huasco. Dr. Philippi has recorded its occurrence at Antofagasta.

52. TINAMOTIS PENTLANDI, Vig.

Sacaya and Canchosa.

53. RHEA DARWINI, Gould.

Rhea darwini, Scl. et Huds. Arg. Orn. ii. p. 219; Sclater, P. Z. S. 1890, p. 413; Philippi, Ornis, 1888, p. 159.

Mr. Lane's first box contained two young specimens and portions of an adult of this Rhea. The second box contained an adult male from Canchosa, obtained February 4, 1890.

4. On the Pouch and Brain of the Male Thylacine.

By Frank E. Beddard, M.A., Prosector to the Society.

[Received January 31, 1891].

On the 5th day of February of last year the male Thylacine which was purchased by the Society in 1884 died. Its death gave me the opportunity of noting a few points in the structure which have not been as yet described and figured, or have been only briefly and incompletely dealt with.

The Pouch.

The specimen being a male, I was greatly surprised to find a distinct though small pouch, which is shown in the accompanying drawing (fig. 1, p. 139). On referring, however, to the literature of the subject, I discovered that the existence of a pouch in the male Thylacine, although unknown to me, had been previously noted. Sir Richard Owen has thus described [1] it:—"In the male Thylacine the rudimentary marsupium is retained in the form of a broad triangular depression or shallow inverted fold of the abdominal integument, from the middle of which the peduncle of the scrotum is continued."

This account is repeated in the 'Anatomy of Vertebrates' by the same author.

Sir Richard Owen refers in his article "Marsupialia" to a paper by Laurent [2], in which the fœtus of the male Opossum is stated to possess a trace of this pouch. There is a description of this structure illustrated by figures in another paper [3] by the same writer, to which I have been able to refer. It is there stated that the male mammary fœtus of *Didelphis virginiana* has a pouch as well as teats, but that there are no traces in the adult of either structure. The figure which Laurent [4] gives is not at all unlike the drawing of the Thylacine's pouch which I herewith submit to the Society; the scrotum depends from the pouch in a precisely similar way. M. Laurent did not find the pouch to be present in the other species of *Didelphis* which he examined.

A recent paper upon the same subject [5], but dealing with a large

[1] Todd's Cyclopædia, Article Marsupialia, vol. iii. p. 328.

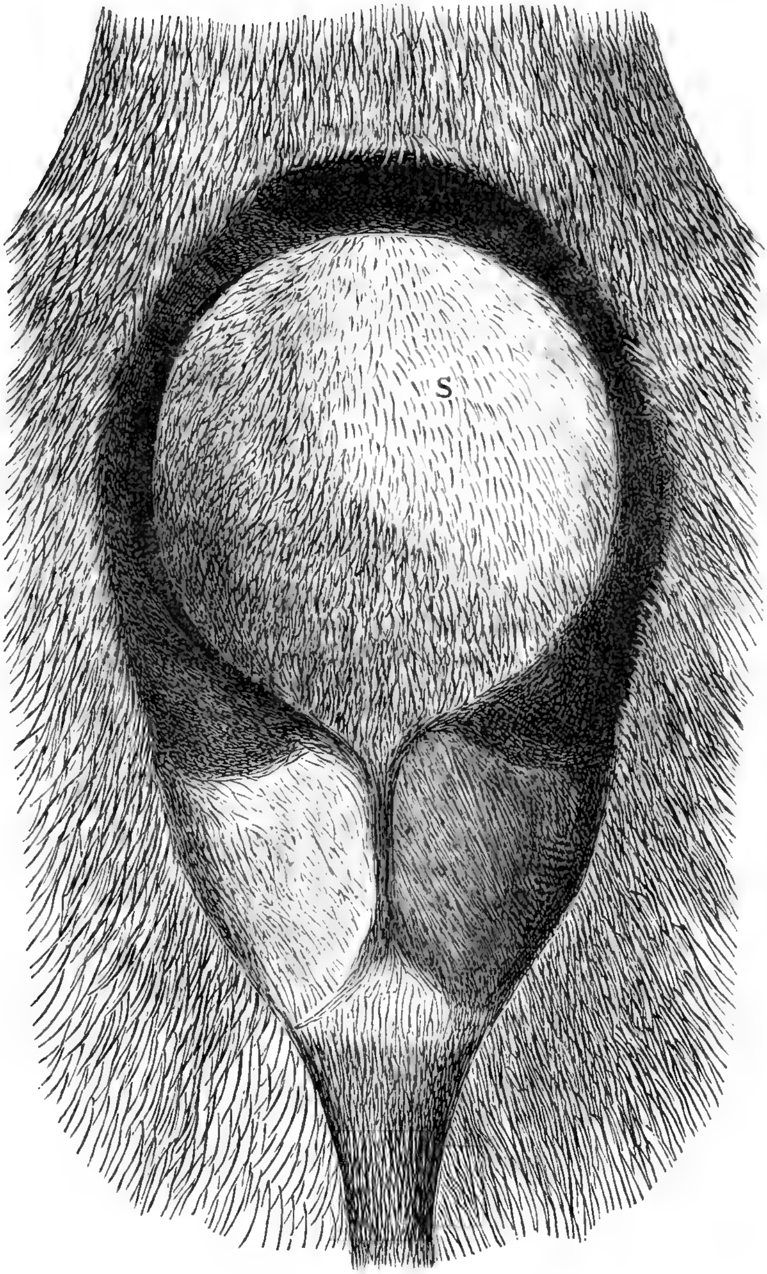
[2] "Recherches Anatomiques et Physiologiques sur les Mammifères Marsupiaux," Annales Franç. d'Anat. et Phys. 1839, vol. iii. p. 231. This paper is called "Extraits de plusieurs mémoires insérés dans la zoologie du voyage de la *Favorite*," &c.

[3] "Recherches Anatomiques et Physiologiques sur les Mammifères Marsupiaux," Mag. de Zool. 1837. This paper is repeated, with the Plates, in the 'Voyage de la *Favorite*,' 1839.

[4] Pl. 22. figs. 1, 1*a*, 1*b*.

[5] O. Katz, "Zur Kenntniss der Bauchdecke und der mit ihr verknüpften Organe bei den Beutelthieren," Zeitschr. wiss. Zool. Bd. xxxvi. pp. 611–670, pls. xxxviii., xxxix.

Fig. 1.



Pouch of young male Thylacine. *S*, Scrotum.

variety of different types, shows that the transitory existence of a pouch in the young male is quite a common feature among Marsupials, especially perhaps among the carnivorous forms.

A pouch was found in the young male *Dasyurus ursinus* up to the age of four months (its length being at that time 19·8 cm.), and one occurs in the young *Acrobates pygmæa*.

A pouch was barely traceable in the young male *Phalangista vulpina*, just visible in a 4·6 cm. long *Belideus breviceps*, three weeks old. The adult males of these forms have of course no pouch nor trace of one.

In *Perameles nasuta* there was a trace of a pouch discoverable in the young, but none in *Halmaturus thetidis*.

The pouch is stated to open backwards in *Dasyurus*, as Owen says of *Thylacinus* and MM. Eydoux and Laurent of *Perameles*.

It is evident from the paper to which I have referred, that the existence of a pouch, transitory or otherwise, among the male Marsupials is not confined to the carnivorous section of the Order, though apparently more commonly met with and longer persistent among the members of that section.

As the organ in the male Thylacine has not to my knowledge been illustrated, I have thought it desirable to have the accompanying drawing (p. 139) prepared.

The figure shows the pouch, which was sketched by Mr. Smit immediately after the death of the animal, and the scrotum containing the testicles, which depends from the interior of the pouch. The drawing also shows that there is not merely a tract of naked skin surrounding the testes, but a deepish pouch which is overhung by the surrounding integument; the pouch is deepest in front and gradually gets shallower behind; it follows therefore that the pouch is directed backwards as in *Perameles*. The general outline of the pouch is oval, or rather pear-shaped, for there is a narrow continuation of it backwards; the scrotum supported on a short stalk depends from the interior of the pouch nearer to the posterior than to the anterior extremity.

The Brain.

In order to injure the skull as little as possible, the brain was extracted in two halves, the skull having been sawn through the median vertical longitudinal plane. The brain was hardened in alcohol, and had a curious yellow colour not always seen in brains so prepared; the brains of a Kangaroo and a Wallaby, which I had prepared for comparison with that of the Thylacine, were white; on the other hand, the brain of a Sloth (also preserved in alcohol) showed the same brownish-yellow tint.

The total length of the brain, measured from the end of the cerebellum to the anterior extremity of the olfactory lobe, was 76 millim.

Greatest length of cerebral hemispheres 48 millim.

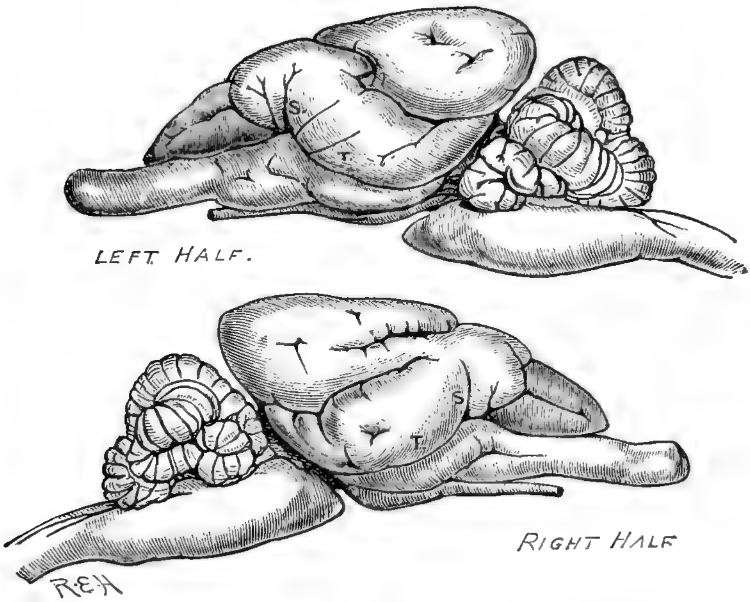
Greatest height of cerebral hemispheres 26 millim.

These measurements refer in all cases to the hardened brain.

The only descriptions of the Thylacine brain with which I am acquainted are contained in Professor Flower's memoir upon the Marsupial brain [1], that by Gervais, and that by Sir Richard Owen in the 'Anatomy of Vertebrates.' Prof. Flower figures the internal aspect of a longitudinal median section as well as a transverse section through the corpus callosum. His description of the brain is limited to the following passage in his paper (p. 646):—

"The large carnivorous Marsupial, the Thylacine (*Thylacinus*

Fig. 2.



Brain of Thylacine, right and left halves, a little reduced from natural size. *S*, Sylvian fissure. *T*, Rhinal fissure.

cynocephalus), so widely separated in external characters from both the Kangaroo and Wombat, shows the same general peculiarities of cerebral organization, but attended with a smaller development of the superior transverse commissure, especially of its anterior part, and a greater reduction of the thickness of the interventricular septum."

Sir Richard Owen (*loc. cit.* vol. iii. p. 105) remarks that *Thylacinus* "has the anterior apex of the hemisphere marked off by a deeper transverse fissure, extending to the inner surface," and that "there is a short fissure above the back part of the hippocampal one." He does not, however, refer to any fuller description of this brain, but

[1] "On the Commissures of the Cerebral Hemispheres of the Marsupialia and Monotremata as compared with those of the Placental Mammals," Phil. Trans. 1865, pp. 633–651, pls. xxxvi.–xxxviii.

only to Prof. Flower's paper already cited and to a paper by himself[1] which contains no description or figures of the Thylacine's brain.

Gervais's description[2] is not taken from the actual brain, but from a cast of the interior of the skull which is figured[3] from above: he writes:—"The principal peculiarities presented by this cast consist in the preponderance of the posterior lobule of the hemispheres over the anterior, and, in consequence of this peculiarity, in the forward position of the Sylvian fissure. The anterior lobule is besides more compressed than in other Marsupials, and we have already seen in that fact a means of removing *Thylacoleo* from *Thylacinus* in classification. In the last-mentioned form the olfactory lobules are borne by a strong peduncle and they project notably beyond the anterior border of the hemispheres. As regards the hemispheres themselves, it appears that they are not without convolutions; it is easy to distinguish one around the Sylvian fissure, and there is a marked transverse depression nearly median, although laterally it tends towards the posterior boundary. It marks the line of division between the two lobes, and may be considered as representing the fissure of Rolando. An anterior depression corresponds to the crucial sulcus, and there are traces of convolutions in the part which forms the posterior lobule."

Since the Thylacine is an animal which is getting scarcer, I have thought that an attempt at a fuller description of the brain than is to be found in the memoirs cited might be acceptable, particularly if illustrated sufficiently.

The press of other work unfortunately prevented me from studying the brain in the fresh condition, which would have been very desirable. Prof. Huxley[4] points out what erroneous conclusions may be reached by drawing inferences from the preserved brain only. But I am inclined to think that he has a little exaggerated the danger which is incurred from this proceeding. At any rate I can find no such alteration in the direction of the fissures in the brain of a Kangaroo which I sketched before and after preservation in alcohol. It is noticeable that the brains figured by Prof. Huxley, in which an alteration is to be observed, are of different sexes, though of about the same size. With brains prepared as carefully as they are in my laboratory, the danger of alteration is reduced to a minimum.

In the brain when viewed from above, the cerebral hemispheres, as in other Marsupials, do not only not overlap the cerebellum, but they only just reach it; they come nearer, however, than in the Wallaby (*Halmaturus bennetti*) or in the Koala (*Phascolarctos*) according to Mr. W. A. Forbes[5], or in the Opossum according to Owen[6]. This,

[1] "On the Structure of the Brain in Marsupial Animals," Phil. Trans. 1837, pp. 87–96, pls. v.–vii.

[2] "Mémoire sur les Formes Cérébrales propres aux Marsupiaux," Nouv. Arch. Mus. t. v. pp. 229–251, pls. xiii., xiv.

[3] Pl. xiv. fig. 7.

[4] "On the Brain of *Ateles paniscus*," P. Z. S. 1861, pp. 247–260, pl. xxix.

[5] "On some points in the Anatomy of the Koala (*Phascolarctos cinereus*)," P. Z. S. 1881, p. 191, fig. 3.

[6] Phil. Trans. *t. c.* pl. v. fig. 6.

coupled with the divergence of the two hemispheres posteriorly, leaves the corpora quadrigemina partially exposed. The degree to which the corpora quadrigemina are exposed is about the same as in the Kangaroo, but considerably less than in the Wallaby or Opossum, or for the matter of that in the Rodent *Dolichotis*, the brain of which I propose to describe later.

The cerebral hemispheres are not greatly convoluted. Judging from Owen's figures of the Opossum and the *Dasyurus ursinus*, there is a progressive complication of the folds in passing from the smaller to the larger forms, such as is often seen among mammals; the Thylacine, which is the largest animal, has the greatest development of furrows of the three. Nevertheless the brain of this Marsupial is much smoother than that of a Kangaroo of about the same size. Sir Richard Owen's figure of the Dasyure's brain [1] is a little indistinct; I am not therefore able to compare it with the Thylacine very accurately. As compared with the Kangaroo [2], the sulci are less numerous and often shallower.

In the Kangaroo's brain the Sylvian fissure is deep and the convolutions are arranged in a series of arches round and above this fissure, as in the Carnivora; the "arched" arrangement is perhaps not so plain as in the Carnivora, and there are only two arches. In the Thylacine such an arrangement of the gyri could not be made out, the principal furrows passing obliquely so as to divide the brain into three unequal segments. The furrow separating the hemispheres proper from the olfactory portion (the hippocampal gyrus) is well marked, and as usual is bent upwards at about the middle of its course, but the angle formed is not so acute as in *Macropus*. From the highest point of this bend arises the Sylvian fissure (*S*, fig. 2, p. 141), which passes nearly vertically upwards and is about half an inch in length. On one side of the brain the Sylvian fissure could be followed as a very shallow groove into the posterior of the two principal sulci.

On a dorsal view the hemispheres are seen to be divided into three unequally sized areas by two furrows running obliquely and approximately parallel to each other. The posterior fissure reaches the middle line of the brain 29 mm. in front of its posterior boundary, *i. e.* 19 mm. behind anterior boundary of hemispheres. On the left side of the brain this fissure runs parallel with the rhinal fissure; the commencement only is shown in Gervais's figure: near to its posterior termination it gives off a short descending fissure which does not reach the rhinal fissure, but stops short about a

[1] *Loc. cit.* pl. v. fig. 5.

[2] I follow Owen's figure (Phil. Trans. 1837, pl. v. fig. 4, and pl. vi. fig. 1), which, except for some slight differences, probably individual, agrees with a brain in my possession. Gervais's figure of the brain of a "Kangurou géant" (*loc. cit.* pl. 13. fig. 1), which I take to be the same species, is that of a larger individual (?) and is more convoluted, and the convolutions are a little different; but the cast which he figures is like the brain before me. Sir W. Turner's figure ("The Convolution of the Brain; A Study in Comparative Anatomy," Journ. Anat. Phys., Oct. 1890, p. 118. fig. 11) of *Macropus major* is nearly identical with the brain I have examined.

quarter of an inch in front of it. On the right hemisphere this fissure is slightly different, as will be seen from a comparison of figs. 2 and 3, and the indentations on the posterior lobe are a little better marked.

The second furrow is continuous with the rhinal furrow just in front of the Sylvian fissure; its course is much the same on both sides of the body. The anterior lobe of the brain cut off by this fissure is U-shaped, a longitudinally running furrow nearly dividing it into two.

Sir William Turner[1] remarks that "the configuration of the brain and the pattern of the convolutions have followed in each order a process of evolution characteristic of the order, the arrangement of the convolutions does not follow the same plan in the various orders. Hence, in the comparison of the brains of mammals with each other, diversities often are recognized which make it impossible to determine the presence of precisely homologous fissures and convolutions in the whole series of the Gyrencephala."

It appears to me that this statement might also be extended in the case of the Marsupials to a single order; it is extremely difficult to compare the convolutions of the brain of *Thylacinus* with those of the brain of *Macropus*.

The points which they have in common are:—(1) The strongly marked and continuous rhinal fissure; but this is found in most mammals. (2) The separation of an anterior lobe (*cf.* fig. 2, p. 141) by a transverse fissure; such a lobe is not for example to be seen in the brain of *Dolichotis*, nor is it of course to be seen in the "lissencephalous" Koala &c. Judging from Gervais's figures this lobe was particularly conspicuous in the extinct *Thylacoleo*. M. Gervais's observations upon the cast of the brain of this latter Marsupial are of particular interest in relation to a well-known controversy. I may remark, however, that the brain of *Thylacoleo* appears to have differed from those of the Wombat and Kangaroo no less than from that of the Thylacine by the *outward* direction of the longitudinal furrow dividing the anterior lobe. However, in *Halmaturus bennetti* the furrows in question are intermediate between the two extremes, being straight. It appears to me that *Halmaturus* and *Hypsiprymnus* come much nearer to *Thylacoleo* than the Wombat does in the form of their cerebral convolutions. M. Gervais himself considers that the Wombat is the closest ally of *Thylacoleo* in these points of structure. (3) In common with many other lower mammals, the lobus hippocampi is not marked by furrows, and is not covered by an extension downwards of the pallium. Finally, of course, there are the important differences in the commissures.

With the exception of the Sylvian fissure and the sulcus which divides off the anterior lobe of the brain and the rhinal furrow, it seems to me to be very difficult to compare the furrows and convolutions of *Thylacinus* with those of the Diprotodont Marsupials. The Sylvian fissure is directed at first slightly forwards, and then

[1] *Loc. cit.* p. 152.

bends back. In the Kangaroo and Wallaby it is directed backwards, and apparently also in the Koala.

The fissure which separates the anterior lobe of the cerebellum is directed forwards in the Thylacine[1], but is nearly vertical in the Kangaroo and Wallaby, though with a decidedly forward inclination. I do not feel able at present to identify any of the remaining fissures of the Thylacine's brain with those of the Kangaroo.

With regard to the other viscera, I have not much to add to Prof. Cunningham's[2] excellent account; I may remark, however, that one of the papillary muscles connected with the right auriculo-ventricular valve is attached to the free wall of the ventricle. I call attention to this point since Mr. Hatchett-Jackson[3] has particularly mentioned as a characteristic of the Marsupials that all these muscles arise from the septal part of the ventricular wall. I have preserved a record of the number and arrangement of the papillary muscles in order to compare them with those of other Marsupials. I do not, however, think that a description would serve much purpose until I am in the position to describe a large series of specimens; the variation in these muscles from individual to individual needs to be first discounted.

February 17, 1891.

Prof. Flower, C.B., LL.D., F.R.S., President, in the Chair.

Mr. Edward Gerrard, Jr., exhibited a very fine head of a Koodoo Antelope (*Strepsiceros kudu*). The specimen had been shot by Mr. F. C. Selous, near the River Macloutsie, Khama's Country, South Africa, on May 23rd, 1890. The length of the horns was 3 ft. $9\frac{1}{2}$ in. on one side, and 3 ft. 9 in. on the other, measured in a straight line from the base to the extremity.

Mr. T. D. A. Cockerell exhibited some abnormal specimens of *Clausilia rugosa*, Drap. (*C. bidentata*, Ström), and made the following remarks:—

The specimens exhibited were all found in the same place, at the base of a wall, at Isleworth, Middlesex, on Feb. 15th. The specimen with the two apertures (figs. 1, 2, p. 146) shows a curious result of a fracture of part of the body-whorl behind the original mouth of the

[1] The importance of this furrow is shown by the fact that it is the most prominent one next to the rhinal fissure in the Opossum. See Appendix to Dr. Elliott Coues's paper "On the Osteology and Myology of *Didelphys virginiana*," Mem. Bost. Soc. Nat. Hist. 1872, by Dr. Wyman, where a figure will be found.

[2] In Zool. Chall. Exp. vol. v.

[3] Forms of Animal Life, 2nd ed. p. 369.

shell, which remains uninjured. Instead of merely repairing the wall of the shell, the animal has constructed a new aperture, which, although not so perfectly formed as the first one, still has the lamellæ and general structure of the normal mouth. A similar monstrosity is figured by Moquin-Tandon, Hist. Nat. Moll. France, pl. xxiv. fig. 19.

The other two specimens (fig. 3) are noticeable because, although from the same place, they differ so much in size, form of the aperture,

Fig. 1.

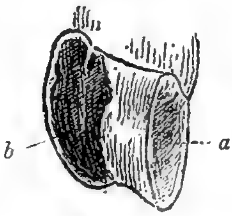


Fig. 2.

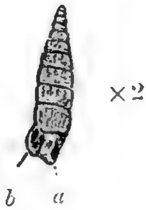
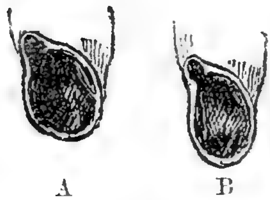


Fig. 3.



Specimens of *Clausilia rugosa* from Isleworth, Middlesex.

Figs. 1, 2. Specimen with two apertures, the new one having been formed after a fracture of part of the body-whorl.

Fig. 3. Specimens having different characters, A being fully developed, and B probably stunted by an algoid growth.—A. Nearly symmetrically pyriform aperture of clean specimen, 12 millim. long; B. Non-symmetrically pyriform aperture of specimen coated with alga, and 10 millim. long.

and general structure that they look almost like examples of different species. It will be noticed that the larger specimen, 12 millim. long, with the nearly symmetrically pyriform aperture, is clean; while the smaller one, 10 millim. long, with the asymmetrically pyriform aperture, is coated with an algoid growth, which was green and conspicuous when the shell was found. Possibly this affords us a clue to the reason of the differences between the shells. Messrs. Bornet and Flahault (Bull. Soc. Bot. France, 1890) have been investigating certain parasitic algæ which live in shells, and, penetrating under the epidermis, destroy the hard structures by degrees. This has been observed in marine and freshwater shells, and is very possibly one cause of that very common condition among the latter known as decollation. Is it not therefore possible that something of the kind may occur in the case of those small examples of *Clausilia rugosa* one often finds coated with a green algoid growth? The destruction caused by the alga would seem in this case to be of a very gradual character, not preventing the growth of the shell, but tending to make it small and on the whole less well-formed.

If this explanation is correct, the peculiarities of these small forms are clearly somatogenic, and it would be a matter of interest to ascertain whether they are in any degree inherited.

The species here called *Clausilia rugosa* has been divided by some authors into two or more, and the characters given for the supposed distinct species are often such as we have just noted above. Moquin-Tandon (1855) described *C. perversa*, which somewhat resembles our small form, and *C. nigricans*, which in the form of the aperture is like our larger one. Westerlund (1884) gave *C. bidentata*, Ström, 10 millim. long, and *C. rugosa*, Drap., 12 millim. long; and these are just the respective dimensions of our two forms.

It thus appears that, although these specimens do not prove the specific identity of these and other segregates from *C. rugosa*, they show that some of the characters relied upon to distinguish them are probably of no specific importance.

Mr. Boulenger exhibited the renewed left pectoral limb of a *Protopterus annectens*, living in the Society's Gardens, and made the following remarks:—

A few days ago Miss Catherine Hopley kindly informed me that one of the *Protopteri* now living in the Society's Gardens, after having had its left pectoral limb nibbled off by one of its companions about three months ago (as she had been informed by the keeper of the Reptile-house), had reproduced the said limb in a trifid condition. Fearing that so interesting an object might be lost by being again bitten off, I removed the reproduced trifid portion of the limb, which I now exhibit.

The limb was bitten off about two-thirds of an inch from its base, and on being regenerated presented, in addition to the prolongation of the longitudinal axis with its series of mesomeres, two preaxial or dorsal branches, similar to, but shorter and more slender than, the axial; these additional branches are, like the axial, divided into cartilaginous segments, comparable to the parameres of the *Ceratodus*-limb. My friend Prof. Howes, who has kindly made a preparation of the specimen, has ascertained that the supplementary rays are fused together at the base by their proximal segments.

A few years ago Albrecht[1] described and figured a *Protopterus* with a bifid right fore limb, remarking that its condition might be regarded as giving support to Goette's and Wiedersheim's theory of the evolution of the pentadactyle limb. The specimen now noticed

[1] Sitzungsb. Ak. Berl. 1886, p. 545, pl. vi.

is therefore interesting as invalidating such an interpretation, as well as the morphological significance attached by Albrecht to his specimen, the bifid limb of which, I have no doubt, was likewise produced by regeneration. Whether the case now noticed is one of reversion, as I have noticed in the scaling of the reproduced tails of Lizards, or merely comparable to the bifid or trifid tails of the same Reptiles, is a point on which I will refrain from expressing an opinion.

Mr. Boulenger also exhibited young specimens and eggs of a South-African Siluroid fish, *Galeichthys feliceps*, which had been sent to him by Mr. J. M. Leslie, of Port Elizabeth, with the information that the ova had been obtained from the mouth of the adult fish. The fact that in the genera *Arius* and *Osteogeniosus* the male takes charge of the eggs in this manner was well known, but Mr. Leslie's observation was of importance as adding a third, though closely allied, genus to the list of the Siluroids which thus protect their offspring. According to Mr. Leslie, the number of eggs in one fish's mouth was about thirty, each of which measures about six lines in diameter.

The following papers were read :—

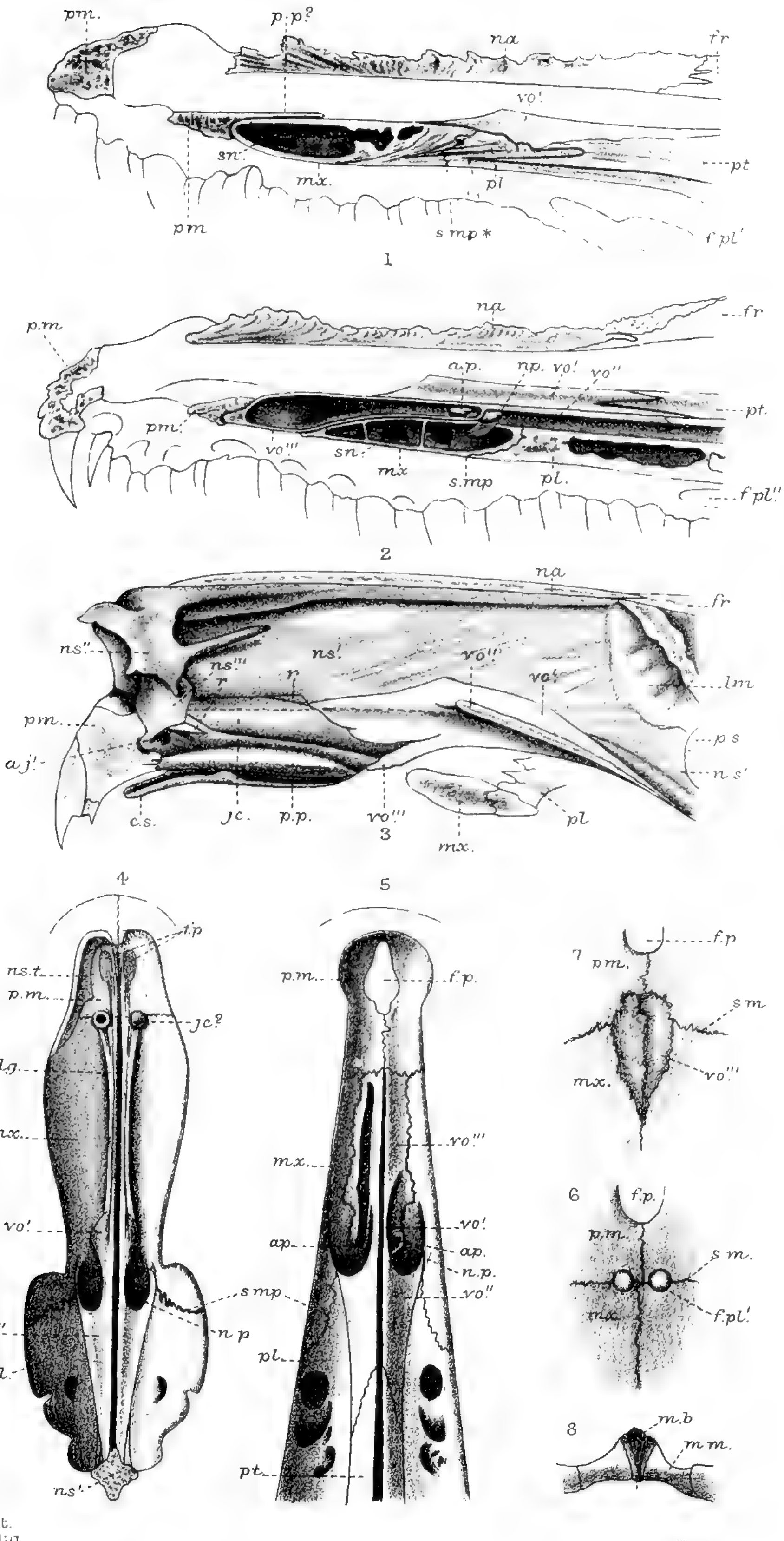
1. On the Probable Existence of a Jacobson's Organ among the Crocodilia; with Observations upon the Skeleton of that Organ in the Mammalia, and upon the Basi-Mandibular Elements in the Vertebrata. By G. B. Howes, F.Z.S., F.L.S., Assistant Professor of Zoology, Royal College of Science, London.

[Received February 17, 1891.]

(Plate XIV.)

I. The Black Caiman (*Caiman niger*), of Inter-Tropical America, is, with the exception of *Tomistoma*, the only Emydosaurian living in which the vomers are freely intercalated between the bones of the palato-maxillary series. In *Tomistoma* they are so disposed as to be visible from beneath over a short and constricted area between the posterior ends of the palatines, as was first shown by Müller and Schlegel[1]. In *Caiman niger* they are, unlike those of all other Crocodilia, prolonged forwards into the premaxillo-maxillary region, and their inflated free ends (*vo.'''*, Plate XIV. fig. 7) occupy a wide inter-

[1] *Cf.* Huxley, Journ. Linn. Soc. Lond., Zool. vol. iv. pp. 17, 19 (1860). For synonymy see Boulenger's Brit. Mus. Cat. of Chelonians, Rhynchocephalians, and Crocodiles, 1889, p. 276.



G.B.H.ad nat.
M.P.Parker lith.

West, Newman imp.

Supposed Jacobson's Organ in the Crocodilia.

space between the premaxillo-maxillary sutures (*s.m.*), to be referred to in full later on. This remarkable departure from the Crocodilian type of structure was first described by Owen[1]; Huxley redescribed it seven years later[2]; and both writers referred it to the one isolated species named. Gray, with that mischievous originality for which he was so notorious, gave the character[3] as diagnostic of the genus *Jacare*, and his error has been transcribed by Lydekker in the 'Palæontologia Indica'[4]. It remained for Boulenger to rectify matters; and in having done so, to show[5] that the feature remains distinctive of the species (*C. niger*) in which it was originally described, and of none other.

The leading fact that the vomers of *Caiman niger* are, at their point of intercalation between the premaxillo-maxillary bones, inflated and bullate (*vo.'''*, fig. 2) was apparently known to Owen (*loc. cit.*); and a detailed account of the general relationships of these bones has been given by Huxley[6]. Their remarkable characters, however, have neither received that attention which they deserve, nor have attempts been thus far made to decipher their meaning. It is precisely this gap in our knowledge which, thanks to some specimens generously placed at my disposal by Prof. Huxley, I would now attempt to fill.

The vomers of the short-snouted Crocodilia in ordinary (*vo.'*, fig. 1) usually commence to taper anteriorly at a point more or less vertically disposed above the maxillo-palatine suture (*s.mp.*). There is much variation individually and with age in respect to the exact position of the point referred to; but while it generally lies behind the suture named, it may more rarely be situated in front of it (ex. *Alligator mississippiensis*, fig. 4). From this point forwards, each vomer rapidly tapers and disappears on the upper surface of the palatine process of its corresponding maxilla (*mx.*), and with that it may become early ankylosed (ex. *Crocodilus niloticus*). In *Caiman niger*, however, the vomers (*vo.'*, fig. 2) pass on to the middle maxillary region (*i. e.* beyond that point at which these bones ordinarily cease altogether in other Crocodilia) before they commence to taper; instead of dwindling away to a pointed extremity, they descend, becoming bullate as they do so, and, thrusting themselves between the maxillary bones, terminate as aforesaid within the palatal region. These expanded intercalary extremities of the vomers (*vo.'''*, fig. 2) may be appropriately termed their *palatine lobes*.

The *Crocodilia* and *Hatteria* are exceptional among living Reptilia in that their "pterygoid bones send forward median processes which separate the palatines and reach the vomers"[7]; an essentially similar condition appears to be realized in some *Chelonia* by the backward

[1] Cat. Ost. Ser. R. Coll. of Surgeons, vol. i. p. 166 (1853).
[2] *Loc. cit.* p. 4.
[3] Brit. Mus. Cat. Shield Rept. ii. p. 25 (1872).
[4] Vol. x. (iii.) p. 210 (1885).
[5] *Loc. cit.* p. 293.
[6] *Loc. cit.* pp. 4–5.
[7] Huxley, Quart. Journ. Geol. Soc. vol. xxxi. p. 426 (1875).

prolongation of the vomer[1]. The pterygoids of the Crocodilia (*pt.*, fig. 2) unite before reaching the vomers to form a gutter-like bed for reception of the free edge of the septum nasi (*cf.* fig. 5), in a manner repetitional of that of the Mammalian vomer. They furnish, as is well known, the median longitudinal partition for the narial pharynx (marked *pt.* in fig. 1), and the rostrum formed by their union bifurcates antero-dorsally to give attachment to the vomers, while antero-ventrally it tapers off into a delicate spur (* of fig. 1) which enters the palatines from behind, and may be traced forwards through their substance to the region of the maxillo-palatine suture (*s.mp.*). Setting this spur aside, the point of termination anteriorly of the pterygoid rostrum (*pt.*, fig. 1) is usually coincident with that of the post-palatine foramen (*f.pl.''*). In *Caiman niger* (fig. 1) it lies well in front of this; and, as the vomer in that animal extends forwards to an unusual degree, it might appear that there is, so to speak, a sympathy or correlation of growth between the two bones. Indications of such a correlation are forthcoming on comparison of a series of skulls, but examination of a larger number is needed before more can be said upon this point. Another and perhaps more significant feature arrested my attention, while comparing a series of longitudinal sections of skulls of *Crocodilus palustris* and *Alligator mississippiensis* of different ages—viz. that the vomer reaches farthest forwards in the younger individuals, and that, whereas in the adult *Crocodilus palustris* the point of anterior termination of the pterygoid rostrum (*pt.*, fig. 1) closely approximates, as has been said (*suprà*), to that of the post-palatine foramen (*f.pl.'*), in the young (half-grown) individual it lies well in front of it. In other words, there is evidence to show that during the early post-embryonic life of the Crocodile the vomers and pterygoids grow less rapidly than the adjacent bony parts, and become, as it were, shortened up.

II. Having adduced reason to believe that the Crocodilian vomer in all probability undergoes, in ordinary, a process of shortening up during early life, the question naturally presents itself whether the differences between the vomer of *Caiman niger* and the other short-nosed Crocodilia might not be expressive of degrees of abbreviation of that bone from before backwards; and if so, whether that which I have here termed its palatine lobe (above, p. 149) may not represent something which the remaining Crocodilia have lost. I have already shown that, among those forms examined by myself, *Alligator mississippiensis* approximates most nearly to *Caiman niger* in the forward prolongation of its vomer; and, with this fact in mind, I naturally turned to the former animal as most likely to yield traces of the missing parts. In this I was not disappointed, as the sequel will show; and my investigation has brought to light some facts of unexpected interest.

Upon first comparison of the skulls of *Caiman niger* and *Alligator*

[1] *Cf.* Boulenger, *op. cit.* pp. 2, 17.

mississippiensis (figs. 1 and 2), the bullate cavity of the vomer of the former (*vo.'''*) might appear to lie within the area of, and indeed to be represented by, the anterior divisions of the maxillary sinus of the latter (*sn.*). The distinctness in the Caiman of the two bones named shows, firstly that this cannot be the case, and secondly that the extension of the maxilla of *Alligator mississipiensis* into the region of the palatine lobe of the vomer of *Caiman niger* must have been one of the changes resulting from the loss of the latter, should that have been brought about as supposed.

The premaxillo-maxillary sutures of the adult *Alligator mississippiensis* meet at all points, and the two pairs of bones form a conjoint and complete osseous roof to the mouth. It has, however, hitherto escaped notice that matters may be otherwise in the young of this species, for the sutures in question may be, in them, interrupted by a couple of rounded fenestræ (fig. 6, *f. pl.'*) having the customary relationships of the prepalatine foramina of other Amniota. On cutting away, from above, the greater portion of the olfactory organ, and then carefully dissecting off the mucous membrane and cartilaginous floor[1] of the same in the largest juvenile of *Alligator mississippiensis* which I have examined (total length 112 centim.), I was surprised to find a couple of small sacs (*jc.*?, fig. 4) lying within the embrace of the prepalatine foramina. Each is a firm and resistant structure, invested in a fibro-cartilaginous wall, and containing a soft (? vascular) lining. I have been unable to trace any connection either between the capsules of these sacs and the cartilaginous alæ of the olfactory wall, or between their central cavities and those of either the mouth or the nose. So far as I have been able to examine them, they appear to be to all intents and purposes closed vesicles, vestigial in nature. That they correspond in position with at least the anterior extremities of, and must be looked upon as directly related to, the bullate palatine lobes of the vomers of *Caiman niger*, I hold it to be sufficiently clear; and it remains now to seek the clue to the remaining portions of the latter bones.

On laying bare the nasal organ of any Crocodile from the side, it will generally be found, on removing the mucous membrane, that the anterior truncated extremity of the vomer is buried in a more or less powerful ligament (*lg.*, fig. 4) which runs forwards towards the premaxillary region. Among those genera and species which I have examined, this ligament is most powerful in *Osteolæmus tetraspis* of W. Africa; in my specimen of that animal it assumes the form of an upturned fold or keel, which, as viewed from the side, continues forwards as it were the body of the vomer, instead of the more general one of a cord-like structure continuous with its tapering extremity. This *vomerine ligament* (*lg.*, fig. 4), as already stated, may be traced forwards into the premaxillary region; its fibres usually there blend with those of the premaxillo-maxillary periosteum, and when (as for ex. in *Crocodilus palustris*, fig. 1) a "palatine process" of the premaxilla (*p.p.*) is present, they may be traced to an insertion into that. In the young *Alligator missis-*

[1] A portion of this is represented *in situ* at *ns.f.* in fig. 4.

sippiensis, in which I found the areæ of the pre-palatine foramina to be occupied by the two small sacs before mentioned (*jc.* ?, fig. 4), the fibres of these vomerine ligaments could be traced to a connection with both the membranous expansions closing the former and the fibro-cartilaginous walls of the latter. The established doctrines of morphology and the rules of precedent alike allow us to regard these ligaments as the equivalents of the "missing parts," and to look upon them and the sacs of the prepalatine foramina as the vestigial remains of the palatine lobes of the vomers of *Caiman niger* with their associated structures.

I have unfortunately been unable to obtain the head of a *Caiman niger* in spirit; but inasmuch as in a small *C. sclerops* of 125 centim.[1] I have found pre-palatine foramina to be present in a form identical with that of *Alligator mississippiensis*, the conclusion formulated above receives additional support. I find the pre-palatine foramina to be present in most, but not all, of the skulls of *Alligator mississippiensis* which I have examined smaller than the one afore dealt with in detail (total length 112 centim.); while in the skulls of two adults preserved in the Natural History Museum, which Mr. Boulenger has kindly afforded me an opportunity of examining, I find (on the left side of the one and the right side of the other) an insignificant perforation which may perhaps be a last vestige of the prepalatine foramen (?), but this is doubtful. It is clear, from all, that the structures possessed by my specimen here figured (figs. 5 and 6) when present must disappear with advancing age; and it has yet to be ascertained if their like is not to be found in other allied genera and species.

III. The only structure with which it is possible to homologize a cartilaginous sac in intimate relationship with the prepalatine foramen of a Reptile is the Organ of Jacobson. This has of late years received an exceptional amount of attention. Leydig has described[2] its general features and relationships in certain Lacertilia, in that masterly manner so peculiarly his own. Its more detailed characters and origin have been incidentally dealt with by Born, in the course of a series of lengthy monographs[3] devoted to a comparative study of the nasal chamber and its ducts; while Solger, Wright, and others[4] have furnished details about it in certain reptilian forms. Concerning the *Crocodilia*, its absence is everywhere proclaimed; and Beard, who has most recently investigated the facts of its early development, specially states[5] that he "searched for it in Chelonians and in embryo Crocodiles, but in vain."

All recent inquiry has rendered it more and more clear that the

[1] Tail broken; measurement taken to posterior extremity of cloacal orifice.
[2] Die in Deutschld. lebend. Arten d. Saurier. Tübingen, 1872, pp. 96–99.
[3] Morph. Jahrb. Bd. ii. bis, viii. (1877–1883).
[4] For a full bibliography with detailed references, see Beard in Zoolog. Jahrb. Bd. iii. pp. 778–780 (1889).
[5] *Loc. cit.* p. 772.

essential functional constituent of Jacobson's organ is to be regarded "as a highly specialized portion of the olfactory epithelium"[1]. As it exists among Reptiles it may be defined as a distinct sac lying (on each side) immediately beneath the anterior portion of the nasal chamber, and communicating with the mouth-cavity by means of a delicate duct, which arises posteriorly and passes obliquely downwards and forwards, immediately external to the vomer, to reach its anterior extremity[2]. Examination of any ordinary Lizard will show that the organ itself lies immediately above and to the outer side of the vomer, and that the point of communication between its duct and the mouth lies within the embrace and at the anterior end of a fold of mucous membrane common to it and the posterior nostril.

Jacobson's organ, as is well known, attains its greatest differentiation among Mammals. Its more minute structure has been worked out by Klein[3], Harvey[4], and others; and a more general communication upon it has been recently published by Herzfeld[5], in which a classification has been attempted, in accordance with the presence or absence of naso-palatine canals and with other leading features described. This organ lies, in Mammals, within the embrace of a cartilaginous sheath (*jc.*, fig. 3) derivative of a downgrowth (*ns.''*) of the alary cartilage of the nose (*ns.''*), and it is in communication with the olfactory chamber by a wide orifice (*e.j.*) which overlies the naso-palatine (Stenson's) canal (*c.s.*). The main body of the organ of each side, with its surrounding cartilage, is supported upon a scroll-shaped prolongation of the premaxilla (*p.m.*) usually termed its palatine process (*p.p.*) This passes back and at the posterior extremity of the entire organ meets a special lobe of the vomer (*vo.'''*): between the latter bone and the supporting apparatus of the Jacobson's organ there is invariably an intimate relationship.

Comparison of the Mammal (fig. 3) with the Crocodilian *Caiman niger* (fig. 2) shows that there is a fundamental similarity in position between the so-called "palatine process" of the premaxilla in the former (*p.p.*), and that which I have herein termed the palatine lobe of the vomer in the latter (*vo.'''*). Albrecht[6], Sutton[7], and Parker[8] have directed attention to the fact that the so-called "palatine process" of the Mammalia may be distinct in origin from the body of the premaxilla with which it ankyloses. I have long been suspicious of a similarly distinct origin of the same for the Common Rabbit (*Lepus cuniculus*) here figured; and my pupil, Mr. R. H. Burne, who, at my request, has looked into the matter, has shown me that such is the case in embryos measuring 8 centim. in length. Parker has described the vomer of certain *Edentata, Insectivora*,

[1] Ramsay Wright, Zoolog. Anzeiger, 1883, p. 393.
[2] *Cf.* Leydig, *op. cit.* pp. 96, 99, and pl. viii.
[3] Quart. Journ. Micr. Sci. n. s. vol. xxi. pp. 219 & 549 (1881).
[4] *Ibid.* vol. xxii. p. 50 (1882).
[5] Zoolog. Jahrb. Bd. iii. p. 551 (1889).
[6] Corresp. deutsch. anthrop. Gesellsch. München, 1883, no. 11, p. 170.
[7] P. Z. S. 1884, p. 566.
[8] Phil. Tr. pt. i. 1885, pp. 1–275.

and *Marsupialia* as consisting, in the young animal, of a series of distinct elements, for the most part paired, which he asserted [1] may be (*Cuscus*) as many as ten in number. Sutton, following in the same wake, has proposed to homologize the "prepalatine" centre of the mammalian maxilla with the vomer of the *Ichthyopsida*, and to interpret the vomer of the former as the parasphenoid of the latter. He relies chiefly upon discoveries of Albrecht's, which have been shown by Sir W. Turner [2] to be of exclusively pathological interest; and, even were this not so, the subsequent researches of Parker are, in themselves, sufficient to show that his conclusions will not stand the test of further inquiry (*cf. infrà*). The joint observations of these three observers, however, testify to a feeling of doubt as to the exact homologies of those bones lying about the base of the septum nasi and its immediately adjacent structures.

The vomer of the Ichthyopsida and lower Amniota, be it paired or single, is invariably a non-repetitional bone lying immediately behind the premaxilla; and there is considerable evidence to show that the apparently "single vomer" of some of these animals really represents the pair so often present, in a confluent condition. When, in accommodation to the enlarging olfactory organ and the posterior nares, this bone becomes shifted backwards or laterally expanded, its anterior extremity generally remains true to its relationship with the premaxilla. It is necessary to stand firmly upon these facts in dealing with the question now in hand.

Parker's observations show, among other things, that there is no constancy of position and extent of the apparently single portion of the vomer of young mammals. They thereby completely undermine the older conception of that bone, based upon analogy to the adult man, which regarded it as a median element. They suggest, with much forcibility, that we may the more reasonably look upon the mammalian vomer in all its variations as morphologically paired, and that the argument deduced above from the study of the vomers of the Ichthyopsida and lower Amniota may apply throughout. With this Sutton's second conclusion above cited must remain in abeyance.

Chief among the supernumerary elements which Parker has described as giving origin to the Mammalian vomers, together with the palatine processes of the premaxillæ, are certain bilaterally symmetrical ossicles to which he applies the terms "anterior" and "posterior paired vomers." Critical examination of his monograph will show that he has in all probability described the same elements in some embryos as "posterior paired vomers," and in others as "ethmo-turbinals;" and further investigation must show whether he has, as I believe, or has not confused the two with each other, if with nothing else. Concerning his "anterior paired vomers," however, there is less, if any, room for doubt. He has shown that these, together with the "palatine processes" of the premaxillæ, may arise early, before the full differentiation of the bodies of the pre-

[1] *Loc. cit.* pp. 270–271.
[2] Journ. Anat. & Phys. vol. xix. p. 198 (1885).

maxillæ is effected. He asserts that in some of the forms he examined he regarded the anterior paired vomers as the sole representatives of the palatine processes of the premaxillæ. In describing some embryos, his language is only to be so construed as to show that he regarded the latter as representing (*Erinaceus*, p. 149, *Talpa*, p. 179, *Galeopithecus*, p. 253) a fusion of true palatine spurs of the premaxillæ with his anterior paired vomers so often alluded to. In having declared that in the Mole the "anterior paired vomers . . . are slightly separated from the palatine processes of the premaxillaries" (*loc. cit.* p. 166), that in the same animal the "antero-lateral vomers . . . have a very temporary and doubtful existence independent of these processes of the premaxillaries" (p. 179), and that while the palatine processes of the premaxillaries of the Shrew in having "no separate antero-lateral vomer attached to them" have "the same deficiency" as the Mole (p. 200), he has both involved himself in a contradiction and shown that he was unable to draw a sharp distinction between the palatine processes of the premaxillæ and his anterior paired (or lateral) vomers. The salient conclusions which arise out of Parker's investigation are (α) that we can no longer regard those structures ordinarily described among mammals as "palatine processes of the premaxillæ" as throughout homologous; and (β) that the latter are, in a number of cases, no parts of the premaxillæ at all, but rather referable to the vomerine category. In his discovery of the complex nature of the (non-pathological) premaxilla of mammals Parker is at one with Albrecht, who has shown that there is reason for regarding the premaxillæ of the adult *Ornithorhynchus* as a combination of distinct elements [1].

All those mammals for which Parker has recorded the presence of "anterior paired vomers" are long-nosed [2]. Comparison of the skulls of the adults with those of the young, as figured by him, will show that while the bones in question may in some cases pass over to the true vomers, they more generally remain exclusively related to Jacobson's organ, which they ensheath in the form of the so-called premaxillary palatine processes, and their products of fusion and metamorphosis lie, for the most part, within the area of the latter as ordinarily described—occupy, that is to say, that of the palatine lobe of *Caiman niger* (*vo.‴*, fig. 2), in which the present inquiry finds its focus. Putting all together, nothing is clearer than that the vomers and palatine processes of the premaxillaries, which have been, I take it, sufficiently shown to be serial elements of a common category, lie collectively within the area of the vomers of the lower Amniota on one hand, and of the Crocodilian *Caiman niger* on the other. Collating these facts with those before recapitulated concerning the non-duplication and fundamental relationships of the vomers in the lower Vertebrata, we may most reasonably conclude that the bones referred to as anterior paired vomers and palatine processes have "become separate by absorption" (most probably

[1] Anat. Schriften., Hamburg & Leipzig, Op. 31, 1883.

[2] *Centetes, Cyclothurus, Erinaceus, Galeopithecus, Manis, Orycteropus, Rhynchocyon, Sorex, Talpa, Tatusia.*

under elongation of the snout, with its accompanying specialization) in the manner suggested by Parker himself for the "inter-palatines" of *Tarsipes*[1].

IV. The foregoing considerations justify us in regarding the palatine process of the mammalian premaxilla, which, be it remembered, ensheaths the organ of Jacobson, and the palatine lobe of the vomer of *Caiman niger* as, at least provisionally, one and the same element; and it is necessary now to turn to the latter, by way of inquiring how far its inner capsule may or may not be found to agree with that of the organ named.

There can be now no doubt that that structure sometimes referred to in the Amphibia as an organ of Jacobson is a maxillary sinus, non-homologous with the Jacobson's organ of the higher Vertebrata. The latter exists, in that which the known facts of development show to be most nearly its original form, among the Lacertilia. Its general relationships in these animals have been already described (above, p. 153). That the naso-palatine canal of the quadrupedal mammals (*c.s.*, fig. 3) is the representative of the closed duct of the Lizards can hardly be doubted, on comparison of the two types; it has been shown by Herzfeld to be regularly absent in some mammals, while the aperture of communication between the body of Jacobson's organ and the floor of the nasal chamber (*a.j.'*, fig. 3), met with in most mammals, is unrepresented in reptiles. On a survey of the known facts, I incline to the belief that the development of the last-named orifice is to be correlated with the loss of communication between the naso-palatine duct and the body of the organ, and that its appearance may have led up to that suppression of the duct in question seen in some forms (ex. *Equus*[2]). Be this supposition worth what it may, the accepted principles of morphology forbid our looking upon the Jacobson's organs of Reptiles and Mammals as in any way distinct.

The vomerine bulla of *Caiman niger* (*vo.'''*, figs. 2 and 5) occupies an essentially similar position to the body of Jacobson's organ in both Mammals and Reptiles. Its aperture of communication with the nasal pharynx lies, like that of the duct of the Jacobson's organ in the Lizards (and less conspicuously, but no less surely, like that of mammals), within the area of the true posterior nostril. As I have been unable to examine a spirit-preserved head I am not in position to state whether, as seems not unlikely, a tubular duct may have arisen at this point or not. While, however, I have been unable to detect in any other Crocodile the entrance thereabouts of any nerve or blood-vessel such as might conceivably have been transmitted by it, sufficient of the dried remains of its lining membrane was present to enable me to assert, with assurance, that it contained a prolongation of the olfactory mucous membrane. This being so, its orifice might be not inaptly compared either to that of the Jacobson's organ of a

[1] Stud. Mus. Univ. Coll. Dundee, vol. i. p. 80 (1890).
[2] Herzfeld, *loc. cit.* p. 556.

Lizard in a backwardly displaced position, such as it might have come to assume under changes incident on the elongation of the snout, or to that of communication between the body of this organ and its duct—the latter having presumably disappeared.

From the foregoing facts and considerations, the conclusion seems, to me, inevitable that those animals from which both Crocodilia and Mammals have descended must have possessed, among other things, a vomer which met the pterygoids behind, and, like that of the Ichthyopsida and lower Amniota, extended to the premaxillary region in front,—in a word, the vomer of the living *Hatteria*. Born has shown[1] that the Jacobson's organ of the Lacertilia is largely supported upon the vomer; did that bone completely enclose it, a condition of the parts essentially like that of the bullate palatine lobe of *Caiman niger* would result. Klein has shown[2] that whereas in the *Rabbit* the cartilaginous sheath of Jacobson's organ (*jc.*, fig. 3) is a complete tube and its bony sheath an incomplete one, in the *Guinea-pig* the latter tends to form "an almost complete capsule" anteriorly. In this, the palatine process of the premaxilla of the mammal, assuming its apparent vomerine homology, clearly approximates towards the condition of the palatine lobe of the vomer of *Caiman niger*.

Putting the foregoing facts and considerations together, the probability that the vomer of *Caiman niger* may lodge a (perhaps modified) Jacobson's organ becomes very great indeed; especially if, as is sometimes stated, that organ may[3] "degenerate into a mere air-sinus."

I am fully alive to the possibility that, on the grounds laid down by Parker, the vomer of *Caiman niger* may be perhaps a compound structure. I should be exceedingly grateful to anyone who would procure me well-preserved heads of this animal, old and young, for the further elucidation of the questions raised.

If the characters and relationships of the vomer are to be taken as criteria of affinity, I need hardly point out that the facts herein dealt with indicate that the short-snouted Alligators, as represented by *Caiman niger*, must be considered to be the least modified of living Emydosauria,—the prevailing view to the contrary notwithstanding.

V. The Crocodilian premaxilla (*p.m.*, fig. 1) often bears that which might at first sight be taken to represent a palatine process (*p.p.*); and the existence of this spur of bone appears to have been generally overlooked. It is very variable in its individual developement, and my own skulls of *Crocodilus palustris* show that it increases in length with advancing age. It is absent in *Caiman niger*; and, when present in other forms, it invariably overlies the maxilla as represented in fig. 1. These facts, in conjunction with

[1] *Op. cit.* Bd. v.
[2] *Loc. cit.* pp. 554–555.
[3] Wiedersheim, Lehrb. d. vergl. Anat., Aufl. 2, p. 400 (1886).

those already described (*ante*, p. 151) concerning its relationship to the vomerine ligament (*lg.*, fig. 4), show it to be a secondary outgrowth, arising in correlation with the shortening up of the vomer, and having little, if anything, to do with the palatine process as ordinarily understood.

VI. Parker, in his monograph on the development of the skull in the Crocodilia, described[1] the early differentiation of a basi-mandibular cartilage, such as he had previously encountered[2] in the embryo of *Chelone viridis*. He states, on the authority of Prof. C. Stewart, of the R. College of Surgeons, that in the embryo Crocodile the conjugated distal ends of the mandibles (Meckel's cartilages) become dilated. My friend Mr. Boulenger has recently called attention in these 'Proceedings'[3] to the existence of a small bone in the mandibular symphysis of ***Heloderma***; and he inclines towards associating it with the mento-Meckelian bones, well known to occur in the living Anura. The latter (*m.m.*, fig. 8) arise as ossifications of the Meckelian cartilages, and the distal ends of those rods generally unite, in these animals, to form a prominent mass which may exactly correspond to the symphysial cartilage of Stewart. I have long been familiar with the fact that in some Anura (ex. *Hyla cærulea*, fig. 8) this (*m.b.*) may become segmented off in the manner of the basal cartilages of the postoral visceral arches of the lower Ichthyopsida, and of the cartilage described by Parker in the young embryos of *Crocodilus* and *Chelone*; it would therefore appear to be altogether independent of the mento-Meckelian bones.

The existence of this "basi-mandibular" element of the mandibular arch is not without interest, in view of the belief in the serial homology between the latter and the postoral skeletal arches[4].

During this investigation I have had the good fortune to have been repeatedly in conference with my friend Mr. Boulenger; and my best thanks are due to him for having, by his valuable assistance and advice, rendered my task, in itself pleasurable, doubly so.

EXPLANATION OF PLATE XIV.

Fig. 1. *Crocodilus palustris*. Median longitudinal section through nasal region of dried skull. *One-third nat. size.*

Fig. 2. *Caiman niger*, dried skull. A similar section to fig. 1, cut to the right of the middle line. *One-third nat. size.*

Fig. 3. *Lepus cuniculus*. Dissection of inner portion of olfactory capsule of left side; to show the vomer and other supporting elements, in relation to the organ of Jacobson. *Twice nat. size.*

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[1] Trans. Z. S. vol. xi. p. 280 (1883).

[2] Challenger Rep. Zool. vol. i. pt. 5, p. 20 (1880).

[3] Above, p. 111.

[4] *Cf.* Huxley, Journ. Anat. and Phys. vol. x. pp. 421 & 427 (1876); and Parker, *op. cit.* White has recently recorded the existence of a basi-mandibular cartilage in *Læmargus* (Anat. Anz. 1890, p. 260).

Fig. 4. *Alligator mississippiensis, juv.* of 112 *centim. total length.* Floor of olfactory chamber, as seen from above, after the removal of the olfactory mucous membrane and the underlying cartilaginous floor of the olfactory capsule. (A portion of the latter, which was left in position, is indicated at *ns.f.*) *Nat. size.*

Fig. 5. *Caiman niger.* Comparison dissection to fig. 4; dried skull only. *One-third nat size.*

Fig. 6. *Alligator mississippiensis, juv.* Premaxillo-maxillary suture with parts adjacent, ventral aspect. *Three times nat. size.*

Fig. 7. *Caiman niger.* Premaxillo-maxillary suture with adjacent parts, for comparison with fig. 6. Ventral aspect. *One-half nat. size.*

Fig. 8. *Hyla cærulea.* Mandibular symphysis, with related structures. Anterior aspect. *Three times nat. size.*

Reference Letters.

a.j'. Anterior orifice of Jacobson's organ.
ap. Orifice of vomerine sac (? Jacobson's organ).
c.s. Naso-palatine (Stenson's) canal, cartilaginous wall of.
fb. Symphysial fibrous pad.
f.p. Premaxillary foramen.
f.pl'. Prepalatine foramen.
f.pl''. Postpalatine foramen.
fr. Frontal.
jc. Jacobson's cartilage.
lg. Vomerine ligament.
m.b. Basi-mandibular cartilage.
m.m. Mento-Meckelian bone.
mx. Maxilla.
na. Nasal.
n. p. Posterior nares.
n.s'. Septum nasi.
n.s''. Alary cartilage.
n.s'''. Alary cartilage, internal, lamina of.
ns.f. Floor of cartilaginous olfactory capsule.
pl. Palatine.
pm. Premaxilla.
p.p. Palatine process of premaxilla.
pt. Pterygoid.
s.mp. Maxillo-palatine suture.
sn. Maxillary sinus.
vo'. Body of vomer.
vo''. Wing of vomer (osseous floor of postnarial portion of olfactory chamber).
vo'''. Palatine lobe of vomer.

2. On the Variation and Development of the Leporine Sternum. By R. H. Burne, B.A. Oxon., F.Z.S.

[Received February 17, 1891.]

The mammalian sternum has been shown by Ruge[1] to be entirely costal in origin. The ventral ends of each pair of ribs come into apposition and subsequently fuse in the middle line to form, by ossification and segmentation, a sternebra; each sternebra is a product of the pair of ribs immediately behind it.

This holds good for the whole sternum, with the exception of its most anterior segment or manubrium: that, although in Man a product of the first two pairs of ribs, and therefore serially homologous with a couple of the sternebræ, is still further a compound structure, for Goette[2] has shown that it may embody (*Talpa*) the remnant of the episternum (interclavicle[3]) of the lower Vertebrata.

[1] "Untersuchg. ü. d. Entwickelungsvg. am Brustbein," Morph. Jahrbuch, pp. 373 *et seq.* (1880).

[2] Archiv f. Anat. u. Phys., Bd. xiv. p. 563 (1877).

[3] Howes has recently suggested that this may be the vanishing vestige of a coracoidal archisternum of the Ichthyopsida ('Nature,' vol. xliii. p. 269, 1891).

Ruge has pointed out that the xiphisternum (processus ensiformis) of Man owes its origin to the eighth and ninth pairs of ribs; for he says, in the course of the paper above referred to, "das achte und neunte Rippenpaar vom Sternum sich loslösend ihre medialen Produkte noch im Processus ensiformis wiedererkennen lassen."

The Leporine sternum usually consists of four segments, exclusive of the omosternal and xiphisternal ones, and it therefore follows that that pair of ribs which stand related and give origin to the last prexiphisternal sternebra is the sixth pair; and as this is so the xiphisternum, on analogy to the human subject, might be expected to arise from the seventh and eighth ribs, one or both. The seventh pair of ribs ultimately break loose and approximate in the ventral middle line.

Not unfrequently, in both Rabbits and Hares, there is an extra sternebra intercalated behind the sixth (= fourth sternebra as ordinarily enumerated), and the occurrence of this structure (figs. A–F, p.161) has not previously been recorded.

This extra sternebra is invariably displaced dorsally; the lower ends of the seventh pair of ribs pass over its ventral surface and meet in the middle line, repeating as it were, in regard to it, those relationships which they more normally bear to the head of the xiphisternum.

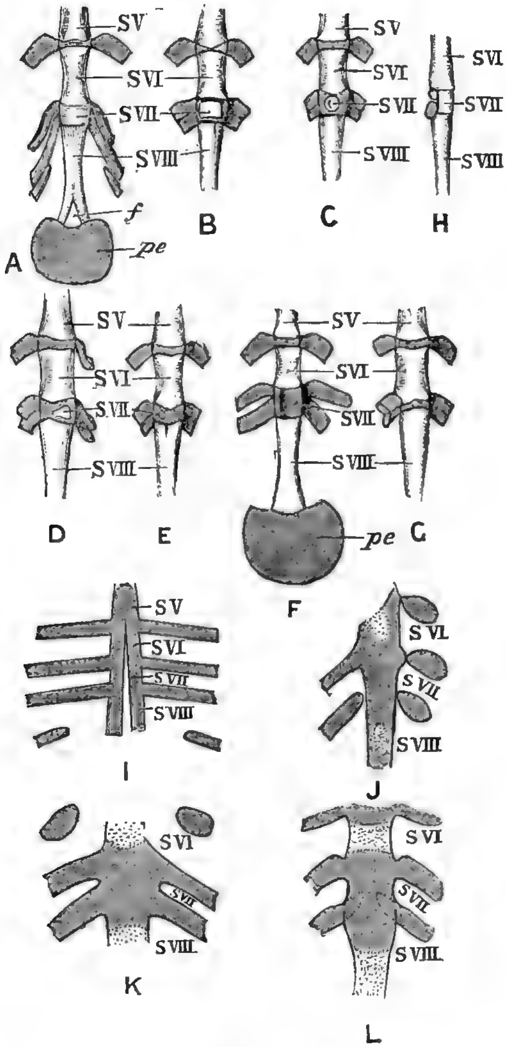
The sternebra in question always lies behind the sixth pair of ribs; these are attached to the synchondrosis between the sixth and the extra sternebra (VII), wherefore the latter would appear to be derived from the seventh pair of ribs.

This seventh sternebra is very variable in size, presumably as the result of variation in degree of absorption. It is probably not uncommon, for of thirteen fully ossified Leporine sterna, which I have examined, six possessed it in some form, and although in one case somewhat minute, it was yet distinctly recognizable.

Figs. A–G represent a series of fully formed sterna. In figs. A, B, C, D, E the extra sternebra (S. VII) will be seen to be represented more or less by bone; but in fig. F it is only present in cartilage, and in fig. G it is not present at all.

In rare cases the two portions of the primitive cartilages from which this sternebra is derived may be found still more or less ununited, a distinct groove being recognizable upon its dorsal surface (fig. F). I have found this to be so in animals possessed of an otherwise fully formed and ossified sternum. Be the individual conditions what they may, the seventh pair of ribs invariably meet in the ventral middle line, and are in no way attached at the sides of their intersternebra as are the ribs in front of them.

Turning now to the development of the seventh or "extra" sternebra. The earliest stage in its formation which I have observed was in an embryo Rabbit 3 cm. long. At this age (fig. I) the median cartilages of the sternum had only fused at their anterior ends; the first seven pairs of ribs were joined to them, but the rest floated free. The costal segments related to each pair of ribs had manifestly been formed each in the same way, the only



Series of sterna of *Lepus cuniculus* showing absorption of the seventh sternebra (dorsal aspect). Nat. size.

A, B, C, D, E show the seventh sternebra ossified; F, the seventh sternebra only represented in cartilage (the two halves had not as yet completely fused); G, normal sternum; H, side view of sternum, showing dorsal displacement of the seventh sternebra; I, sternum of embryo of 3 cm. total length; J, horizontal longitudinal section of sternum of embryo of 7 cm. total length; K, longitudinal section of sternum of embryo of 11 cm. total length; L, sternum of embryo of same age.

Reference letters: *f.*, fontanelle; *pe.*, ensiform process; S. V–VIII, sternebræ.

apparent difference being that the seventh was smaller than the others. This seventh sternebra may thus be regarded as arising from the seventh pair of ribs, just as the other sternebræ do from the ribs in front, and as having a like morphological value with the former.

In the next stage (7 cm. long, fig. J, p. 161) the sternum had begun to ossify, centres of ossification being present in the xiphisternum and in all the sternebræ except the seventh; this structure, however, was still clearly present, although only represented in cartilage.

The seventh sternebra, in comparison with those remaining, is of the same size as in the previous stage. In sterna of this age the seventh pair of ribs have already begun to approximate ventrad of their sternebra, their lower extremities reaching nearly halfway to the middle line. Thus far the growth of the sternum has been regular and uniform, with the exception of the lack of ossification in the seventh sternebra; but about this time the sternebræ begin to grow unequally, and consequently to manifest slight differences in their proportions (figs. K, L). The gap between the sixth and seventh pairs of ribs is, at this stage, usually shorter than in the earlier ones; but occasionally these ribs are separated by a gap (fig. L), indicating that the seventh sternebra is still in process of growth. In none of these specimens was there, however, any sign of ossification in the seventh sternebra, although in all the other sternebræ it was much more pronounced than before.

The points of the seventh pair of ribs had in all cases approached much nearer the middle line than at the earlier stages.

In Rabbits just born (14–15 cm.) the most noticeable feature is the apposition of the lower extremities of the sixth and seventh pairs of ribs, the latter having by this time met in the middle line. None which I examined showed any trace of an ossific centre between the sixth sternebra and the xiphisternum.

It has been seen that in all 3 cm. embryos the seventh costal segment is formed from the seventh pair of ribs, in the same way as are the other costal segments from their respective ribs, and therefore it has morphologically the same value as each of those more normally present; it is, however, somewhat smaller than the other segments. We may therefore assume that in all cases the seventh sternebra is invariably present at an early age and that it differs only from its fellows in size.

All segments of the sternum appear now to grow uniformly; for in all 7 cm. embryos the seventh sternebra is relatively of the same size as in the previous stage; but it is still cartilaginous, all the others being now ossified. So far all the sterna of the same age are much alike; but in 11 cm. embryos the seventh sternebra is usually shorter in comparison with its fellows than in the earlier stages, although in some cases it is still of moderate size. Those in which it was short I take to be the more normal, the seventh sternebra having developed with the rest to a certain extent, and then, when the embryo was about 8 or 9 cm. long, having ceased to grow: the xiphisternum and sixth sternebra, as they increase in size, grow over this minute half-developed cartilaginous seventh sternebra and, as it were, blot it out. Thus there would be left the more familiar form of sternum with no trace of anything between the sixth sternebra and the xiphisternum.

The following, as compared with the above, are the stages in metamorphosis of the permanently seven-segmented type. After the embryo has reached a length of 7–8 cm. the seventh sternebra, instead of ceasing to grow, as in the more familiar form, continues to do so for a longer or shorter time. The growth of this sternebra seems to stop at different ages in different individuals; at a somewhat later stage ossification sets in, more or less strongly, forming in some cases a large bone (fig. A), in others merely a minute nodule (fig. E); in others, again, ossification never occurs at all, and the sternebra persists as cartilage (fig. F).

From the foregoing it may be justly inferred that at some past date the Leporine sternum consisted of eight sternebræ (the xiphisternum being counted as one), and that afterwards, for some unknown reason, the seventh pair of ribs became detached and grew forward over the ventral surface[1].

The place of the seventh sternebra having been thus usurped by the ribs which gave rise to it, the latter (degradation following disuse) apparently began gradually to disappear, until there was realized the condition in which we now find it, *i. e.* that of maximum absorption.

These facts are not only interesting in themselves, but they throw light upon the origin of the xiphisternum. For if it be granted that each sternebra arises from the pair of ribs immediately behind it, the sixth sternebra would be the derivative of the sixth pair of ribs, the seventh when present of the seventh pair, and therefore the eighth (xiphisternum) of the eighth.

The Leporine xiphisternum would thus appear to be not (as the study of it in ordinary would suggest) different in origin from that of Man, but, on the contrary, homologous with it—at any rate as far as concerns its origin from the eighth pair of ribs. I have not been able to ascertain whether the ninth pair of ribs takes any part in its formation as it does in that of Man, but it seems not improbable that it may do so.

Another variation of some slight interest occurs in the xiphisternum: this structure is occasionally seen to be forked, a fontanelle being contained between the prongs (*cf.* fig. A). This split recalls in a minor degree the phenomenon of the "cleft sternum" well known to occasionally occur in the human subject[2]. The groove in the seventh sternebra in fig. F is probably an example of the same failure to unite, but to a still less marked degree. Both these specimens will bear comparison with the Cetacean sternum,

[1] There seems to be an inclination on the part of all the ribs to do this, their articulation with the sternum being much more ventral than dorsal.

[2] *Cf.* Turner, "Description of a Cleft Sternum," Journ. Anat. & Phys. p. 103 (1879).

of which Parker[1] remarks: "There is an oval fontanelle (such as is common in Lizards) in the præsternum and a large part of the mesosternum, and the hinder part of the præsternum is occupied by the primordial fissure."

This inquiry has been carried out in the Biological Laboratory of the Royal College of Science, South Kensington, at the suggestion of my teacher, Prof. G. B. Howes; and to him my sincere thanks are due for his help and supervision.

The features noted apply equally to both the Rabbit (*Lepus cuniculus*) and Hare (*Lepus timidus*): no differences of fundamental importance being recognizable between them.

3. On the Muscicapine Genus *Chasiempis*, with a Description of a new Species. By Scott B. Wilson, F.Z.S.

[Received January 31, 1891.]

I propose in the present paper to state briefly the distinctions between the various species of this interesting genus of Flycatchers which are to be found inhabiting the various islands of the Hawaiian group, and this object will, I think, be greatly furthered by a key. In drawing this up, I have to some extent followed that given by my friend Dr. Stejneger (Proc. U. S. Nat. Mus. 1887, p. 87), and I should also mention here that, quite recently, I sent him a series of the different species in my collection, with the idea of ascertaining his opinion on some difficult points. Dr. Stejneger kindly answered me very fully, and I am glad to say that our views are nearly, if not quite, in accord on the subject.

Graf Hans von Berlepsch was kind enough to send me a short time since a paper of his on *Chasiempis*, containing a good coloured figure of one species. I do not agree with the conclusions at which he arrives, and think that they are partly due to the insufficient material he had to work upon; for, though the collection upon which he based his observations is rich enough as regards the number of specimens, but *one* island—Oahu—seems to be represented in it. I shall comment at length on this paper in the Part of my 'Birds of the Sandwich Islands' which deals with *Chasiempis*, merely stating here that Graf von Berlepsch unites *Chasiempis ridgwayi*, *Ch. ibidis*, *Ch. sclateri*, and *Ch. gayi* under the head of *Chasiempis sandwichensis*, and is of opinion that his series of skins bears this out. As will be seen further on, my views are very different from his, but are more probably correct, as I have had specimens from the different islands for comparison, while he had to rely in a great measure on figures and descriptions.

Another article which must be referred to is that by Dr. Sclater, "On the Muscicapine Genus *Chasiempis*" (Ibis, 1885, p. 17), a

[1] W. K. Parker, Ray Society's Monograph on the Shoulder-girdle and Sternum in Vertebrates, p. 217. *Cf.* also Flower, 'Osteology of Mammalia,' pp. 99, 100, figs. 37, 39.

paper by which the investigation of this difficult genus has been greatly promoted. Dr. Sclater gives two coloured figures, fig. 1 being taken from one of the two specimens obtained by the 'Challenger' Expedition at Hilo, Hawaii, in August 1875; while fig. 2 is from a skin obtained by Dr. Sclater from Verreaux of Paris, and presented to the British Museum. These two specimens he figures under the name of *Chasiempis sandwichensis*, taking them to be the male and female of the same species. He also considers *Chasiempis sclateri* of Ridgway to be identical with fig. 2.

However, as the material I have had to work upon, though of large extent, is in some ways incomplete, I do not feel justified in giving my conclusions as final; nor does Dr. Stejneger, as the following extract from his letter to me will show. He says, "I consider that my conclusions are only provisional; and also that they are the only ones that can be properly drawn up from the material at my disposition now; . . . . additional material might alter my views considerably."

On one point, however, Dr. Stejneger and I are quite decided—the status of one of the species inhabiting Oahu. This is distinct beyond any doubt; and, being so, I have named it after my friend Mr. Francis Gay, of Makaweli, a gentleman whose knowledge of the Avifauna of his native islands is very considerable and to whose assistance I owe much of my success whilst exploring the island of Kauai.

I will now give a short description of the chief distinctive characters of *Chasiempis gayi*.

CHASIEMPIS GAYI.

Breast brown, streaked with black; tail-feathers with white markings occupying only half the extent they do in *Ch. ridgwayi*, though graduated in size from the outer feathers in the same manner; bill bluish black, broader at the base and stouter generally than in any other species of the genus.

Hab. Oahu.

Provisional Key to the genus Chasiempis.

a^1. Wing-markings pure white. Bill bluish black.

- b^1. Upper parts of the body deep smoky grey ...... *Ch. dolei*, Stejn.
- b^2. Upper parts of the body brown; forehead, crown of the head, and breast bright chestnut. *Ch. ridgwayi*, Stejn. [Ibis, 1885, pl. i. fig. 1.]
- b^3. Breast brown, streaked with black; white markings on the tail-feathers occupying only about half the extent they do in *Ch. ridgwayi*; bill stouter and broader at the base than in any other species .... *Ch. gayi*, sp. nov.

a^2. Wing-markings tawny, or "ferruginous white." Bill horn-colour, yellow towards the base of the mandible.

- c^1. Breast light tawny with no trace of black; upper parts of the body bright tawny, as also are the sides of the head and ear-coverts;

rump, flanks, and under tail-coverts bright tawny .... *Ch. sclateri*, Ridgw.

c^3. Breast, rump, and flanks lighter tawny than in the preceding species; under tail-coverts white, very slightly tinged with tawny. Dimensions smaller than the preceding species .... *Ch. ibidis*, Stejn. [Ibis, 1885, pl. i. fig. 2.]

It thus follows that there are, so far as is at present known, five species of *Chasiempis* inhabiting the Sandwich Islands:—

1. *Ch. dolei*, Stejneger.	Kauai.
2. *Ch. sclateri*, Ridgway.	
3. *Ch. gayi*, Wilson.	Oahu.
4. *Ch. ibidis*, Stejneger.	
5. *Ch. ridgwayi*, Stejneger.	Hawaii.

Dr. Stejneger inclines to the belief that there still remains a sixth species, a form with tawny wing-markings, the Sandwich Flycatcher of Latham (*Ch. sandwichensis* of Gmelin), the real habitat of which may be one of the islands between Hawaii and Kauai. His reason for this theory is that Latham's description of the Sandwich Flycatcher, *Ch. sandwichensis*, which is plainly that of a species with tawny wing-markings, does not agree in detail with that of either *Ch. sclateri* or *Ch. ibidis*. In his letter to me he further says "that you did not find it there (on Hawaii) may be due either to it having become exterminated, or to a particular misfortune of yours in not coming across it during your stay on that island."

I have in my collection four specimens from Hawaii with tawny wing-markings, but these I take to be immature examples of *Ch. ridgwayi*. Dr. Stejneger, however, may be right, but this is a question I hope will be satisfactorily solved by the time the part of my 'Birds of the Sandwich Islands' including this genus appears.

4. Description of a new Species of the Genus *Himatione* from the Sandwich Islands. By Scott B. Wilson, F.Z.S.

[Received January 31, 1891.]

I herewith give a brief description of a new species of *Himatione*, based on a single specimen which I obtained in the district of Kula on the island of Maui, in July 1888. I may mention that I killed it and an immature example of *Himatione sanguinea* at one shot. I have named it after my friend Mr. Dole, whose name is so well known amongst those ornithologists that have studied the Hawaiian Avifauna.

Himatione dolei, sp. nov.

Crown of the head grey, shading into dull brown-pink, which is tinged on the sides with dull red; rest of the upper parts dusky brown mottled with greenish buff; beneath, the throat and breast grey, the tips of the feathers brown; belly greenish buff, shading off into white on the under tail-coverts; wing-quills and tail black, the former edged outwardly with a narrow line of white; wing-coverts and secondaries black, edged with brown-pink; irides dark hazel; bill and feet horn-colour.

Dimensions. Total length 5·20 inches, wing 3·10, tail 2·20, culmen ·55, tarsus 1·5.

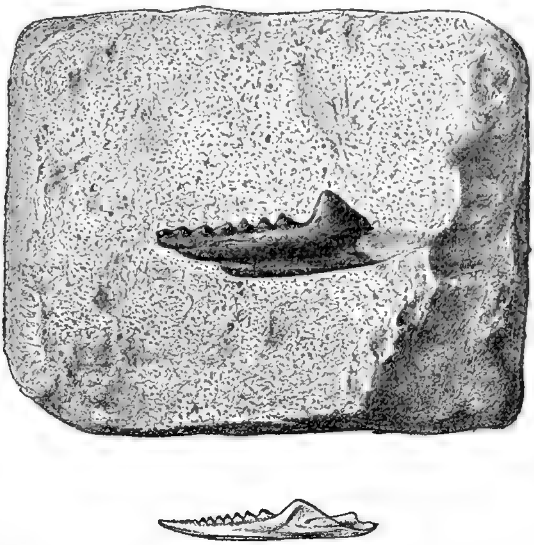
Hab. Maui.

5. On British Remains of *Homœosaurus*, with Remarks on the Classification of the Rhynchocephalia. By G. A. Boulenger.

[Received February 3, 1891.]

The specimen which I have the pleasure of exhibiting before the Society is the greater portion of the left ramus of a mandible which

Fig. 1.



Left mandibular ramus of *Homœosaurus major* (specimen in the College of Surgeons) and *H. maximiliani* (after v. Ammon). Natural size.

agrees, except in the larger size, with that of *Homœosaurus maximiliani*, H. v. Mey.[1], an Upper Jurassic Rhynchocephalian Reptile, remains of about half a dozen individuals of which are known from Bavaria. The chief interest of this specimen lies in its being believed to be

[1] H. v. Meyer, Jahrb. Miner. 1847, p. 182, and Faun. d. Vorwelt, Rept. Lithogr. Schief. p. 101, pl. xi. (1860).
L. v. Ammon, Abh. bayer. Akad. xv. p. 499, 2 pls. (1885).

British, having been found along with other unnamed fossils from this country in the Museum of the College of Surgeons. I have submitted the specimen to my colleague Mr. Etheridge, who was so kind as to examine the matrix and have a section of it prepared, and he informs me that the fossil is in all probability from the Forest Marble, Bath Oolite, of Chippenham or Corsham, Wiltshire. Mr. A. Smith Woodward, for whose kind advice I likewise applied, on being shown the specimen at once produced another, a left maxillary showing its inner aspect, of what I believe to be probably the same animal, but surrounded by a very different matrix. This specimen, recently acquired for the British Museum from Mr. P. Rufford, was obtained in the Purbeck beds of Swanage, Dorsetshire ; it bears the Museum Register No. R. 1765, had been identified by Mr. Woodward as Rhynchocephalian, and was most courteously placed by him at my disposal for examination.

The left ramus in the Museum of the College of Surgeons is imperfect anteriorly, but the missing portion cannot have been great, as may be deduced from the condition of the teeth, of which there are seven, gradually decreasing in height from back to front, so that the symphysial end of the mandible must have had a sharp, nearly straight edge, as we know to be the case in *Homœosaurus*. The coronoid process is perfectly preserved, triangular, its height nearly equalling that of the jaw. The postcoronoid portion is lost, but has left its impression on the stone, and it agrees with the corresponding part in *Homœosaurus*, differing in its shortness from *Sphenodon*. The bone is of a dark brown colour. The length of the entire mandibular ramus must have been about 35 millim., as against 25 in *H. maximiliani*. In this respect it agrees with the specimen from the Kimmeridgian of Hanover described by Struckmann[1]. There is no doubt, in my opinion, that the larger size of the Hanover specimen is not to be attributed to age, considering the state of the dentition in the typical *H. maximiliani*, which indicates an adult animal ; and as I can find no difference between the Hanover specimen and the mandible described above, I propose to designate them both as *H. major*. Comparison cannot, unfortunately, be instituted with *Sapheosaurus*, H. v. Mey., which agrees very nearly in size, but of which the mandible and the alveolar border of the maxillary are still unknown.

As regards the systematic position of *Homœosaurus*, there can be no doubt that it stands in close relation to the living *Sphenodon*, from which it differs, however, in three important points, viz. the absence of the ectepicondylar foramen in the humerus, the absence of uncinate processes to the ribs, and the absence of intercentra or hypapophyses between the dorsal vertebræ, to which characters a fourth may probably be added, viz. the fuller ossification of the vertebral centra, which appear to be less deeply excavated at either end than in *Sphenodon*. All these characters, except the absence of uncinate processes, may be regarded as indicating a higher development in the Rhynchocephalian line. I hold that of the two most recent writers on the

[1] Zeitschr. deutsch. geol. Ges. xxv. p. 249, pl. vii. (1873).

classification of the Rhynchocephalia, Lydekker[1] and Zittel[2], the former has overrated the importance of these characters in assigning to *Homœosaurus* and allies the rank of a suborder, opposed to *Sphenodon, Rhynchosaurus,* and *Hyperodapedon*; while the latter has underrated their importance in uniting *Homœosaurus* and *Sphenodon* in one and the same family. *Homœosaurus* deserves to stand as the type of a distinct family, in the immediate neighbourhood of the *Hatteriidæ*, to which it is more nearly related than to the *Rhynchosauridæ* or than are the latter to the *Hatteriidæ*.

The classifications of the two authors above referred to differ as follows :—

1. Lydekker.

Ord. Rhynchocephalia	Subord. Homœosauria	Fam. *Homœosauridæ.*
		,, *Pleurosauridæ.*
	Subord. Sphenodontina	,, *Telerpetidæ.*
		,, *Sphenodontidæ.*
		,, *Rhynchosauridæ.*
Ord. Proterosauria	....	,, *Proterosauridæ.*

Champsosaurus is not mentioned, but forms a third Suborder (Simœdosauria) of the Rhynchocephalia in the author's more recent Manual[3].

2. Zittel.

Ord. Rhynchocephalia	Subord. Rhynchocephalia s. s.	Fam. *Sphenodontidæ.*
		,, *Rhynchosauridæ.*
	Subord. Proganosauria	,, *Proterosauridæ.*
		,, *Mesosauridæ.*
		,, *Champsosauridæ.*

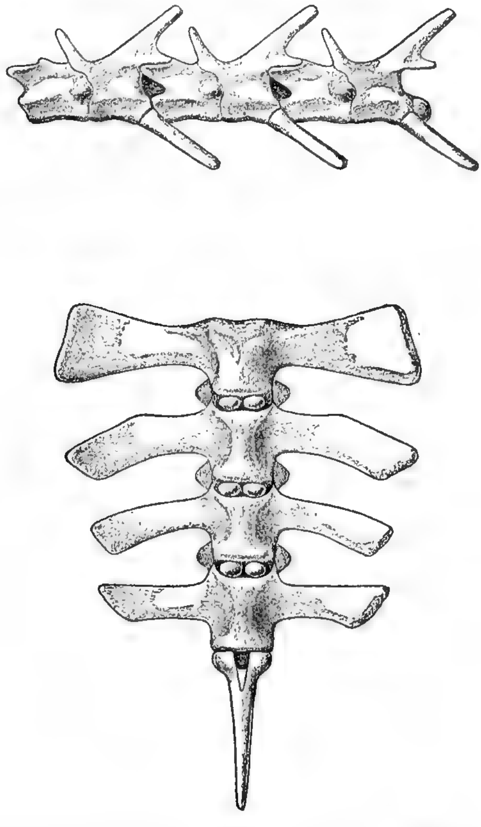
Both these arrangements appear to me unsatisfactory. The Proterosauria are allowed ordinal rank by Lydekker merely provisionally and "in deference to the views of Prof. Seeley." But his definition of the Order is not diagnostic, for such characters as "Cervical vertebræ much elongated" and "Posterior caudal vertebræ with divided neural spines" can certainly not be meant to characterize an Order. As to the latter character in particular, I have to remark that it occurs in certain Lacertilia, and is particularly marked in a genus which, one would think, might not have escaped notice. I now exhibit a skeleton of *Lacerta ocellata,* with the object of showing the curious division of the neural spine of some of the caudal vertebræ (fig. 2, p. 170) into an anterior and a posterior part, as believed to be characteristic of the Proterosauria. In the specimen exhibited, the caudal vertebræ, from the 9th to the 19th inclusively (the rest of the tail being regenerated), bear two neural spines, the anterior directed obliquely forwards, the posterior directed obliquely backwards. Both are processes of the posterior moiety of the vertebra (the caudal vertebræ of these and other fragile-tailed Lizards being divided into two), thus showing that the division of the spine has

[1] Cat. Foss. Rept. i. p. 290 (1888).
[2] Handb. Pal. iii. p. 583 (1889).
[3] Nicholson and Lydekker, Man. Pal. ii. (1889).

nothing to do with the division of the vertebra. I have also noticed a less complete division, or rather bifurcation, of the caudal neural spines in *Agama bibronii*. The specimen further shows very clearly the paired intercentral hypapophyses at the base of the tail, to which attention was called by me at a previous meeting[1].

Returning to the classification of Lydekker, I can only repeat what I have said above as to his division of the Rhynchocephalia into two suborders *Homœosauria* and *Sphenodontina*, that the only

Fig. 2.



Lateral view of middle caudal vertebræ, and lower view of second sacral and three anterior caudal vertebræ of *Lacerta ocellata*. Twice natural size.

diagnostic differences revealed by the definitions are that in the former the præmaxillaries apparently do not form a beak and the ribs have no uncinate processes, whilst in the latter the præmaxillaries form a more or less deflected beak and the ribs have uncinate processes. These characters, even if well founded, would be insufficient for subordinal separation; but they are not exact, for it is well known that *Sphenodon* has præmaxillary teeth; it is therefore

[1] See above, p. 114.

incorrect to speak of a beak, and there is, I think, no evidence of the existence of uncinate processes in *Hyperodapedon*.

Zittel's method differs from Lydekker's in this respect, that he entirely abstains from defining his suborders. We are therefore left to guess how the Proganosauria differ from the Rhynchocephalia *sensu stricto*, and for what reason, for instance, the *Champsosauridæ* are placed in the former group rather than in the latter. Then, again, as the *Proterosauridæ* are included in the Proganosauria, why is the latter term employed in preference to the name Proterosauria, which has priority? It is true this is but one instance out of many of Zittel's disregard of the rules of nomenclature. But does this group Proganosauria, originally founded upon *Stereosternum*, Cope, which is now generally accepted to be synonymous with *Mesosaurus*, Gerv., really belong to the Rhynchocephalia? This is a matter of considerable difficulty to decide, because the two essentially distinctive characters separating the Plesiosauria from the Rhynchocephalia, in the wide sense in which I would take these Orders, viz. the mode of implantation of the teeth and the presence or absence of a lower zygomatic arch in the skull, are not shown by the remains of *Mesosaurus* at present known. But considering other characters, such as the remarkable thickness of the ribs, the shape of the skull and teeth, the absence of claws, I cannot but agree with Seeley and Lydekker in regarding *Mesosaurus* as an early, generalized form of the Nothosaurs, which gradually pass into the long-necked, marine Plesiosaurs. The Proganosauria would nevertheless have to be considered as allies of the early Rhynchocephalia, from which they diverged in the Plesiosaurian direction, the Plesiosauria being, as I think all will now admit, closely connected with the Rhynchocephalia. The point as to whether *Mesosaurus* should be incorporated into the one or the other of these two orders can only, I repeat, be decided on a precise knowledge of the temporal arches and the dentition.

As regards the grouping of the Rhynchocephalian families, I hold that the *Champsosauridæ* should not be placed in a suborder apart from the true Rhynchocephalia, and less still together with *Palæohatteria* and *Proterosaurus*; and that the latter genera well deserve to rank as separate families. In fact, it seems to me that the only satisfactory arrangement of the Rhynchocephalia, on the basis of our present knowledge, may be expressed in the following synopsis. Forms of which we know too little, such as *Telerpeton, Saurosternum*, &c., are necessarily omitted.

Order RHYNCHOCEPHALIA.

Subord. 1. Proterosauria.

Each transverse segment of the plastron composed of numerous pieces. Pubis and ischium plate-like. Fifth metatarsal not modified.

Vertebræ conically excavated at either end, with persistent notochord, all with intervertebral hypapophyses; limb-bones without condyles; humerus with entepicondylar foramen .... 1. *Palæohatteriidæ*.

Vertebræ fully ossified, cervicals opisthocœlous[1], dorsals biconcave; no hypapophyses between the dorsal vertebræ; limb-bones with condyles; humerus with ectepicondylar foramen or groove.. 2. *Proterosauridæ.*

Subord. II. Rhynchocephalia vera.

Each transverse segment of the plastron composed of three pieces, a median angulate and a pair of lateral. Pubis and ischium elongate and fifth metatarsal modified, as in the Lacertilia.

A. Nasal openings distinct. Mandible with coronoid process, the rami not united by suture. Vertebræ deeply biconcave.
 Humerus with ectepicondylar and entepicondylar foramen; ribs with uncinate processes; all the vertebræ with intercentral hypapophyses ...... 3. *Hatteriidæ.*
 Humerus with entepicondylar foramen; ribs without uncinate processes; no hypapophyses between the dorsal vertebræ.......................... 4. *Homœosauridæ.*

B. Nasal opening single. Mandible without coronoid process, the rami united in a solid symphysis. Vertebræ fully ossified, feebly biconcave; no hypapophyses between the dorsal vertebræ. Humerus with ectepicondylar foramen or groove.
 Snout short, ending in a beak.................. .... 5. *Rhynchosauridæ.*
 Snout Crocodilian in shape, with toothed præmaxillaries .... 6. *Champsosauridæ.*

The first family comprises a single genus, *Palæohatteria*, Credn.; the second, *Proterosaurus*, H. v. Mey., and perhaps *Cadaliosaurus*, Credn., and *Aphelosaurus*, Gerv.; these four types are Permian. The third family is for the recent *Sphenodon*, Gray; the fourth contains the Jurassic *Homœosaurus*, H. v. Mey., *Sapheosaurus*, H. v. Mey., and *Pleurosaurus*, H. v. Mey.; the fifth the Triassic *Rhynchosaurus*, Ow., and *Hyperodapedon*, Huxley; the sixth and last the Upper Cretaceous and Lower Eocene *Champsosaurus*, Cope.

6. Preliminary Account of an Earthworm from West Africa referable to a new Genus. By Frank E. Beddard, M.A., F.R.S.E., Prosector to the Society.

[Received February 17, 1891.]

The investigations of Rosa[2], Michaelsen[3], and myself[4] have

[1] I think, after careful examination of the type specimen in the College of Surgeons, that the cervical vertebræ were opisthocœlous in *Proterosaurus*, as described by Seeley; that hypapophyses were absent, except between the anteriormost cervical vertebræ; and that the long, slender cervical ribs were forked proximally.

[2] "Lombrichi dello Scioa," Ann. Mus. Civ. Genova, vol. vi. (1888).

[3] "Beschreibung der von Herrn Dr. Franz Stuhlmann im Mündungsgebiet des Sambesi gesammelten Terricolen," Jahrb. Hamb. Wiss. Anstalt, Bd. vii. (1890); and "Oligochæten des naturhistorischen Museums in Hamburg, IV.," *ib.* Bd. viii. (1891).

[4] "Preliminary Note on a new Earthworm belonging to the Family Eudrilidæ," Zool. Anz. no. 346 (1890); and "Preliminary Note upon *Heliodrilus*, a new Genus of Eudrilidæ," *ib.* No. 349 (1890).

shown that the Earthworm fauna of tropical Africa is very distinctive of that region. A large number of the species that have been described belong to a series of remarkable new genera of the family Eudrilidæ; and these have been found both upon the East and the West coasts, though at present the species and the genera are confined to one side of the continent or the other. Besides the Eudrilidæ, representatives of the genus *Acanthodrilus* have been met with and a few other forms.

The following is a complete list of Central and South-African Earthworms, excluding only representatives of the genera *Lumbricus* and *Allolobophora,* which are probably not indigenous except in the North; those that are queried require further identification.

(1) Eudrilus *jullieni,* Horst. Liberia[1].
(2) *Teleudrilus ragazzii,* Rosa. Scioa.
(3) *Nemertodrilus griseus,* Michaelsen. Quilimane.
(4) *Libyodrilus violaceus,* nov. gen. et n. sp. Lagos.
(5) *Polytoreutus cæruleus,* Mich. Mainland opposite Zanzibar.
(6) *Stuhlmannia variabilis,* Mich. Mainland opposite Zanzibar.
(7) *Preussia siphonochæta,* Mich. Barombi, Cameroons.
(8) *Paradrilus rosæ,* Mich. Barombi, Cameroons.
(9) *Eudriloides gypsatus,* Mich. Zanzibar.
(10) *Eudriloides parvus,* Mich. Quilimane.
(11) *Hyperiodrilus africanus,* mihi. Lagos.
(12) *Heliodrilus lagosensis,* mihi. Lagos.
(13) *Pygmæodrilus quilimanensis,* Mich. Quilimane.
(14) Acanthodrilus *capensis,* mihi. Cape.
(15) *Acanthodrilus* (*Benhamia*) *stuhlmanni,* Mich. Quilimane.
(16) *Acanthodrilus* (*Benhamia*) *schlegelii,* Horst. Liberia.
(17) *Acanthodrilus* (*Benhamia*) *büttikoferi,* Horst. Liberia.
(18) *Acanthodrilus* (*Benhamia*) *beddardi,* Horst. Liberia.

[1] This species has been recently described by Dr. Horst ("Sur quelques Lombriciens Exotiques appartenant au Genre *Eudrilus,*" Mém. Soc. Zool. France, t. iii. p. 223) from Liberia, and has been described by Dr. Michaelsen as occurring in Barombi. From Horst's description it is difficult to separate the species from those which have now been recorded from New Caledonia, Martinique, Rio Janeiro, Bahamas, British Guiana, New Zealand; I can add St. Helena as a new locality. Prof. Lovén has kindly exchanged with me specimens of some of the Earthworms described five-and-twenty years ago by Kinberg; among them was a specimen of Kinberg's "*Lumbricus eugeniæ.*" His definition of that species was as follows:—"Lobus cephalicus terminalis, superus reticulatus, partem mediam tertiam latitudinis, partem dimidiam longitudinis, segmenti buccalis occupans; segmentum buccale lateribus et primum corporis longitudine æquali; cingulum e segmentis 13–17 l. 12–14 conjectum; tubercula ventralia duo, inter segmenta 16–17 l. 15–16; segmenta 180; longitudo 180 mm." It is clear from the position of the clitellum that this species could not be a *Lumbricus.* Having dissected it, I find that it is a *Eudrilus,* though I have not been able to find any characters which distinguish it as a species. This genus even now requires revision; it occurs in so many and such widely separated localities that the forms must probably differ specifically.

(19) *Acanthodrilus* (*Benhamia?*) *scioana*, Rosa. Scioa.
(20) *Acanthodrilus* (*Benhamia*) *rosea*, Mich. Gaboon.
(21) *Acanthodrilus* (*Benhamia*) *affinis*, Mich. Quilimane.
(22) *Acanthodrilus* (*Benhamia*) *tenuis*, Mich. Barombi.
(23) **Perionyx**, sp., Mich. East Africa.
(24) *Callidrilus scrobifer*, Mich. Quilimane.
(25) *Microchæta rappii*, mihi. Natal.
(26) *Microchæta beddardi*, Benham. Natal.
(27) *Siphonogaster ægyptiacus*, Levinsen. Banks of Nile.
(28) *Siphonogaster millsoni*, mihi. Yoruba-land.
(29) *Digitibranchus niloticus*, Levinsen (? = *Alma nilotica*). Banks of Nile.
(30) **Perichæta** *capensis*, Horst. Cape of Good Hope.
?(31) *Lumbricus capensis*, Kinberg. Cape[1].
?(32) *Geogenia natalensis*, Kinberg. Natal[2].
?(33) *Hegesipyle hanno*, Kinberg. Natal[3].

It is clear therefore that the Ethiopian region is very well marked as a region by its Earthworm fauna, but that its resemblances are with Patagonia and New Zealand as regards the prevalence of Acanthodrilidæ. [In this list those genera which also occur outside of the Ethiopian region are printed in larger type.]

The specimens of *Libyodrilus violaceus* I owe to the kindness of Mr. Alvan Millson, Assistant Colonial Secretary at Lagos, West Africa; Mr. Millson was so good as to bring a large number of living specimens with him in January of the present year. The living worm is of a uniform greyish-purple colour; it is not active in its movements; when killed in spirit the worms generally protruded the buccal cavity, which, from its rich blood-supply, appeared bright red. One of the characteristics of the genus *Perichæta* is that the buccal cavity is continually protruded and retracted while the animal is in motion; but the protruded portion of the alimentary tract is of a greyish colour, which indicates either the thickness of its walls or

[1] Several other species have been described by Kinberg, but they cannot at present be identified, and I do not therefore think it worth while to mention them in this list. I mention *Lumbricus capensis*, because it is one of those species which I have been able, through the kindness of Prof. Lovén, to examine for myself. This examination, however, has not led to any important results; the specimen was very much softened—a fate which is apt to overtake Earthworms that have not been properly preserved in the first instance. I have found out that *Lumbricus capensis* is *not* a *Lumbricus* at all; Kinberg puts it in that genus on account of the supposed paired character of the setæ. The setæ, as a matter of fact, are not paired; the setæ of each segment are placed far apart from each other, so that from Kinberg's own point of view this species should not have been included in the genus *Lumbricus*. I find too that the gizzard is situated anteriorly, in or about the eighth segment. The species is very possibly an *Acanthodrilus*, but I could not detect any of the other organs of the body, and cannot therefore say more than that it is not a *Lumbricus*.

[2] Perrier (Comptes Rendus, t. cii.) regards this as a distinct generic form; but that was before the various papers on the Eudrilidæ of Africa were published.

[3] This, according to Perrier (*loc. cit.*), is an *Acanthodrilus*.

its deficiency in blood-capillaries—perhaps both ; the extreme vascularity and the thinness of the walls of the buccal cavity in *Libyodrilus* perhaps account for the fact that it is not usually (? ever) protruded during locomotion.

The *setæ* are strictly paired.

There are no *dorsal pores.*

The *clitellum* occupies segments 15 and 16 (in some specimens a part of segment 14 also), and is complete, that is it entirely encircles the body.

The *male reproductive pore* is single and median, upon the border line between segments 17 and 18. The orifice is situated upon the summit of a conspicuous elevation of a yellowish colour.

The *spermathecal* pore is also median and unpaired ; it lies on segment 13 between the ventral pairs of setæ.

The *oviducal pores* occupy what is at present a unique position among Earthworms, viz. on segment 15. Thus another of the characters supposed to distinguish the group Terricolæ no longer holds universally.

The chief characteristic of the family Eudrilidæ is the remarkable development of cœlomic sacs which enclose the different parts of the female reproductive organs.

Libyodrilus, though in some respects approaching *Hyperiodrilus,* offers a new type. A large sac occupies the dorsal region of segments 14–18 ; it is closely adherent to the dorsal vessel and œsophagus ; this sac gives off three pairs of approximately corresponding diverticula ; anteriorly it divides into two, and embraces the œsophagus as in *Hyperiodrilus* ; the two parts are reunited immediately below the œsophagus and run forwards and downwards until they reach the nerve-cord ; here they again divide and reunite upon the ventral side of the nerve-cord, to open by a single median orifice upon segment XIII.

The *oviduct* passes from this sac on each side straight to its external orifice. In transverse section it may be seen that the oviducal funnel opens into the interior of an egg-sac (=receptaculum ovorum, *auctorum*) which is quite independent of the large spermathecal sac, though lodged within it.

The *ovaries* are only visible in immature worms ; they occupy the usual position in segment XIII.

The *sperm-ducts,* which open by ciliated funnels into segments X. and XI., opposite to the *testes,* retain their distinctness until the point of opening into the atria.

The *atria* have a very thick muscular coat ; they open by a common orifice on to the boundary line between segments XVII. and XVIII. ; each is provided with a sac containing a single short penial seta, not ornamented, and ending in a blunt rounded free extremity.

The *nephridia* are paired, but are connected with an integumental network of tubules opening on to the exterior by numerous pores.

The *alimentary tract* consists of the usual divisions ; the œsophagus has no calciferous glands nor ventral pouches ("Chylustaschen" of Michaelsen), which are so characteristic of the Eudrilidæ. There are three gizzards, which, like those of *Heliodrilus* and *Hyperiodrilus*, are situated at the junction of the intestine and œsophagus; each gizzard occupies a single segment. These three genera, which belong to Perrier's Intraclitellian group, show that one of the characters made use of to distinguish that group from the Anteclitellians no longer holds. M. Perrier[1] writes:—"Chez les *Lombriciens anté-clitelliens* que nous avons étudiés, le gésier s'est toujours trouvé placé *en arrière des organes génitaux* et de leurs organes accessoires, en arrière aussi des anses contractiles ou cœurs latéraux de l'appareil circulatoire. Dans ces Vers, l'œsophage est d'ailleurs très-allongé et la ceinture rejetée relativement très-loin en arrière; quelquefois presque au milieu du corps.

"Au contraire, chez tous les Lombriciens intra- ou postclitelliens, le gésier est placé *en avant des testicules et des ovaires*, c'est-à-dire en avant des *organes essentiels* de la génération. Il est également *en avant des centres d'impulsion du sang*, que ce soient des cœurs dorsaux impairs, comme chez l'*Anteus*, ou des cœurs latéraux, comme chez les autres Lombriciens." Since Dr. Horst has discovered[2] an Intraclitellian earthworm, *Glyphidrilus*, in which the clitellum occupies the "anteclitellian" position, viz. from segment 23–31, it is impossible any longer to retain the group "Anteclitelliens."

It is clear, from this brief account of the salient features in the structure of *Libyodrilus*, that it forms a quite new generic type, concerning the particular affinities of which I do not for the present offer any suggestion.

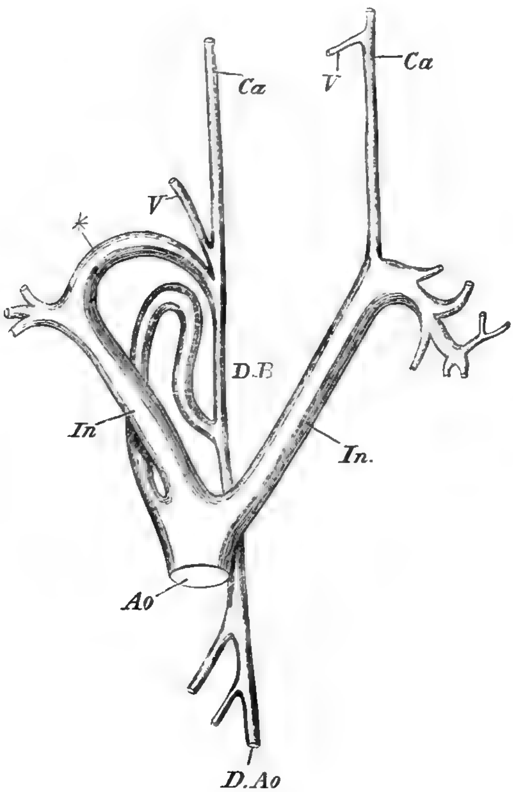
7. On a Functional Ductus Botalli in *Nycticorax violaceus* and *Dafila spinicauda*. By FRANK FINN, B.A., late Scholar of Brasenose College, Oxford. (Communicated by F. E. BEDDARD, F.Z.S., Prosector to the Society.)

[Received February 17, 1891.]

In his memoir on the "Development of the Branchial Arches in Birds," published in the Transactions of the Royal Society of London for 1888, Dr. J. Mackay has described and figured an abnormality which he met with in the dissection of a Guillemot (*Lomvia troile*). This consisted in the existence of "the remains of the dorsal connection between the third and fourth arches upon the right side," "as a distinct cord passing between the common carotid artery and the descending portion of the aortic arch." Dr. Ferdinand Hochstetter also records two obliterated ductus botalli in *Aquila nævia* and *Circus cineraceus* ("Ueber den Ursprung der Arteria subclavia der Vögel," Morph. Jahrb. xvi. p. 484, 1890).

[1] "Mémoires pour servir etc.," Nouv. Arch. Mus. t. viii. p. 156.
[2] Nederl. Dierk. Vereen. Verslag. op. d. Vergad. v., 26 Oct. 1889.

Within the last few months I have come upon two cases of an abnormality similar to the above, but still more marked, inasmuch as instead of a cord a functional vessel was present. In the first instance, which occurred in a Violaceous Night-Heron (*Nycticorax violaceus*), the deviation from the ordinary arrangement was very marked, as is well shown in the figure, which was drawn from the injected specimen by Mr. Harrison, under my supervision. The right carotid was very large at its origin, and ran for about an inch towards the left (this portion of the vessel being marked in the figure by an asterisk), when it turned almost at right angles and ran forward in the usual manner, giving off at the turning point the right vertebral, and a rather larger vessel which ran back to join the dorsal aorta at the base of the heart. In the figure the heart is removed, and the aorta pulled forward to show this junction. Injection proved that this connecting duct had a lumen and was thus quite functional, though apparently not of equal



Carotids of *Nycticorax violaceus*.

Ca, carotids; *V*, vertebrals; *D.B*, ductus botalli; *In*, innominates; *D.Ao*, dorsal aorta. The * marks the enlarged part of the right carotid.

calibre throughout. The vertebrals (*V*, *V*), though given off so far apart, reached the spinal column at about the same point; nor did I observe any abnormality in the vessels of the left side.

The appearance of the abnormal vessels in the other specimen, a Chilian Pintail (*Dafila spinicauda*), though the abnormality was essentially the same, was less striking; the right carotid ran towards the left as in the Heron, for a short distance, but seemed relatively smaller and straighter; but it similarly turned suddenly forwards, at the point of giving off the vertebral, and sent a vessel backwards to the dorsal aorta, which it joined, at the left side of it opposite the base of the heart. This specimen was not injected, but I was able, by passing a bristle down the tube, to satisfy myself that the connection between the carotid and the aorta was a functional one. I also noted that in this specimen the artery supplying the skin of the neck sprang, on the right side, from the same point as the vertebral, while on the left it was smaller and given off a little posteriorly to the vertebral. A ductus arteriosus stretched from the left side of the dorsal aorta to the left pulmonary artery. Professor G. B. Howes has kindly drawn my attention to Professor Turner's paper on *Globiocephalus svineval* (Journ. Anat. & Phys. ii. p. 66, 1868), in which the existence of a closed *ductus arteriosus* between the aorta and pulmonary artery is recorded as occurring in that Cetacean. Messrs. Marshall and Hurst also mention it in the Rabbit.

Although I have dissected examples of upwards of 90 species, the above is the only abnormal variation in the carotids which I have observed; and that in the two specimens in which it occurred it can only be regarded as an individual peculiarity I have had ample opportunities of proving, having dissected three other specimens of *Nycticorax violaceus* and one other of *Dafila spinicauda*, besides two specimens of *Nycticorax griseus* and one of *Dafila bahamensis*, none of which exhibited this abnormality. I find, too, that the late Prof. Garrod has examined the three first-named species, besides *Nycticorax caledonicus*, and has not recorded any abnormality in their carotids.

It would seem therefore that this approach to the reptilian structure does not characterize any particular species or genus, but is liable to appear sporadically in individual specimens of species belonging to widely separated groups.

In conclusion, I have to express my thanks to the Society for the facilities for study which they have afforded me, and in particular to their Prosector, without whose kind tuition and assistance this communication would have been impossible.

February 3, 1891.

February 17, 1891.

LIST OF PLATES.

1891.

PART I.

NOTICE.

The 'Proceedings' are issued in *four* parts, as follows:—

Part I. containing papers read in January and February, on June 1st.
II. ,, ,, ,, March and April, on August 1st.
III. ,, ,, ,, May and June, on October 1st.
IV. ,, ,, ,, November and December, on April 1st.

PROCEEDINGS

OF THE

GENERAL MEETINGS FOR SCIENTIFIC BUSINESS

OF THE

ZOOLOGICAL SOCIETY

OF LONDON,

FOR THE YEAR

1891.

PART II.

CONTAINING PAPERS READ IN

MARCH AND APRIL.

AUGUST 1st, 1891.

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LIST OF CONTENTS.

PART II.—1891.

March 3, 1891.

March 17, 1891.

Contents continued on page 3 of Wrapper.

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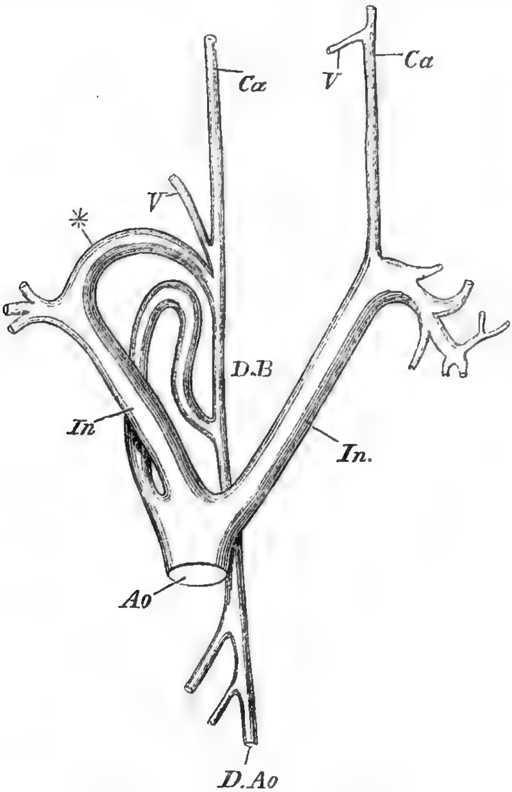

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March 3, 1891.

Prof. Flower, C.B., LL.D., F.R.S., President, in the Chair.

The Secretary read the following report on the additions to the Society's Menagerie during the month of February 1891:—

The total number of registered additions to the Society's Menagerie during the month of February was 65, of which 35 were by presentation, 1 by birth, 15 by purchase, 3 were received in exchange, and 11 on deposit. The total number of departures during the same period, by death and removals, was 69.

Mr. Sclater exhibited the typical and unique specimen of Macgregor's Paradise-bird (*Cnemophilus macgregori*) from the Queensland Museum, Brisbane, which had been kindly lent to him by the authorities of that Institution for the purpose of being figured in 'The Ibis.' Mr. Sclater remarked that *Cnemophilus*, though possibly allied to *Xanthomelus*, was a very distinct genus, having a structure of the bill and frontal plumes something like that of *Diphyllodes*.

Mr. Arthur Thomson, the Society's Head Keeper, exhibited a series of Insects reared in the Insect-house in the Society's Gardens during the past year, and read the following Report on the subject:—

Report on the Insect-house for 1890.

Examples of the following species of Insects have been exhibited in the Insect-house during the past season:—

Silk-producing Bombyces and their Allies.

Indian.

Attacus atlas.
—— *pernyi.*
—— *cynthia.*
—— *ricini.*
Antheræa mylitta.
Actias selene.
Cricula trifenestrata.

American.

Samia cecropia.
—— *ceanothi.*
Telea polyphemus.
Telea promethea.
—— *angulifera.*
Hypochera io.

African.

Antheræa cytherea.
—— *menippe.*
**Henucha smilax.*
Gynanisa isis.
Bunæa caffraria.

* Exhibited for the first time.

Diurnal Lepidoptera.

European.

Papilio podalirius.
—— *machaon.*
Thais polyxena.
*—— *cerisyi.*
Vanessa antiopa.
—— *io.*
—— *urticæ.*
—— *levana.*
Apatura iris.
Melanagria galathea.
Lycæna corydon.
—— *adonis.*
—— *icarus.*
*—— *alsus.*
Anthocharis cardamines.
Argynnis paphia.
—— *aglaia.*

American.

Papilio ajax.
—— *asterias.*
Papilio cresphontes.
Limenitis disippus.

Nocturnal Lepidoptera.

Smerinthus ocellatus.
—— *tiliæ.*
—— *populi.*
Sphinx ligustri.
*—— *oreodaphne.*
**Protopace carolina.*
*—— *celeus.*
**Ceratomia amyntor.*
**Chærocampa capensis.*
—— *elpenor.*
Deilephila euphorbiæ.
—— *galii.*
—— *vespertilio.*
Macroglossa bombyliformis.
Saturnia pyri.
—— *carpini.*
Zygæna filipendulæ.
Eacles regalis.
—— *imperialis.*
**Dryocampa rubicunda.*
Liparis dispar.
Odenestis potatoria.
Bombyx neustria.
**Setina irrorella.*
**Cucullia scrophulariæ.*

Of the insects which I have the honour to place before the Meeting this evening the following are exhibited for the first time, viz.:—*Henucha smilax*, from Natal; *Thais cerisyi* and *Lycæna alsus*, European; *Sphinx oreodaphne, Protopace carolina, Protopace celeus*, and *Ceratomia amyntor*, from N. America; *Chærocampa capensis*, from S. Africa; and *Dryocampa rubicunda*, also from N. America.

During the past season I was again able to rear a fine lot of the larvæ of *Limenitis disippus*, from N. America, upon Weeping-willow; but I am sorry to say that I was not so successful with the Silk-producing Moths.

We received from Mr. J. C. Warburg some specimens of *Empusa egena* from the South of France. One of the specimens sent laid some eggs in the case after arrival and these subsequently hatched out, but I regret to say that, with all our endeavours, we could not succeed in rearing them.

The eggs laid by the Stick Insects (*Diaphemora femorata*) in 1889 also hatched out at intervals, but they did not do by any means so well as the imported eggs.

* Exhibited for the first time.

J. Smit del. et lith.

Mintern Bros. imp.

OTOMYS JACKSONI.

In July and August we received some Spiders from Messrs. Raleigh and C. F. R. Blandy. There are examples of two species of Tarantulas (*Lycosa nigra* and *Lycosa porto-santana*) and specimens of the Zebra Spider (*Argyope fasciata*). These are all from Madeira. One of the Zebra Spiders made a web and laid some eggs; these produced young ones, but they all died.

The following papers were read :—

1. On a Collection of small Mammals made by Mr. F. J. Jackson in Eastern Africa. By Oldfield Thomas.

[Received February 2, 1891.]

(Plate XV.)

By the kindness of the Misses Jackson I have been entrusted with the examination of the small Mammals collected by their brother, Mr. F. J. Jackson, during his recent successful expedition to the interior of the British East-African Company's Territories and up Mount Elgon. Mr. Jackson has already distinguished himself as a collector, and this last expedition, so far beyond the region explored by naturalists, has resulted in the discovery of a very large number of novelties. Mr. Jackson is much to be congratulated on his striking success in this direction[1].

The localities at which the Mammals were collected were as follows :—

Mount Elgon, a volcanic peak, about 14,000 ft. in altitude, N.E. of the Victoria Nyanza, about 1° N., 34° 35′ E.[2] Never ascended previously by any European.

Turquel, in the Sük country, between 1° and 2° N. and 34° and 35° E.; inland British East Africa.

Mianzini, just east of Lake Naivasha, about 0° 55′ S. and 36° 25′ E.; at an altitude of nearly 9000 feet.

The geographical affinities of the collection are extraordinarily mixed, and even dividing the localities, for Mount Elgon is nearly 200 miles distant from Mianzini, the same peculiarity is observable. Thus of the three species marked as from Mount Elgon[3], one is new, with distinct South-African and Abyssinian, *not* West-African, affinities; one is typically West-African (as are many of the birds),

[1] See papers on the Birds by Messrs. Sharpe and Grant, 'Ibis,' 1891.

[2] These positions are taken from the map in Mr. Joseph Thomson's 'Through Masai-land,' 1885.

[3] Unfortunately some of the specimens, although numbered by Mr. Jackson, have not the localities marked on them, so that until his notes arrive the exact localities cannot be recorded; and some of these specimens may also be from Mount Elgon.

and the other occurs over the whole of Africa. The same sort of thing is the case with the other specimens.

In this part of the new British Territories, therefore, we seem to possess a region of exceptional zoological interest, as being the meeting-place of the North-eastern, Western, and Southern faunas; and it is much to be hoped that under the auspices of the Imperial British East-African Company other naturalists will follow Mr. Jackson's spirited example, and that we shall thereby gain a thorough knowledge of the manner in which the different zoological districts pass into one another within our "sphere of influence."

The collection consists of 38 specimens, referable to 15 species, of which three, two Rodents and a Bat, are new to science[1]. The forms mostly belong to groups so obscure zoologically, and so troublesome and difficult of collection under the trying circumstances inseparable from such an expedition, that Mr. Jackson deserves the sincere thanks of zoologists for this material contribution to our knowledge of the smaller Mammals of Africa.

1. Herpestes gracilis, Rüpp.

a. One specimen.

2. Petrodromus tetradactylus, Ptrs.

a. ♂. One specimen.

3. Crocidura hedenborgi, Sund.

a. Mianzini. 8/89.

4. Epomophorus minor, Dobs.

a–c. Turquel, Sük. 1/90.

This rare species has been obtained at Zanzibar and Bagamoyo, and also, by Dr. Emin Pasha, at Kiriamo, just south of the Albert Nyanza.

5. Nyctinomus lobatus, sp. n.

a. ♂. Turquel, Sük. 1/90. *Type.*

Allied to *N. cestoni*, Savi[2], or rather *N. tæniotis*, Raf.[3], as it ought to be called, and to *N. africanus*, Dobs.; but distinguished from both by its larger ears, larger tragus, higher antitragus (fig. p. 183), and coloration, while in other respects it agrees sometimes with one and sometimes with the other, and forms in some respects a connecting-link between them.

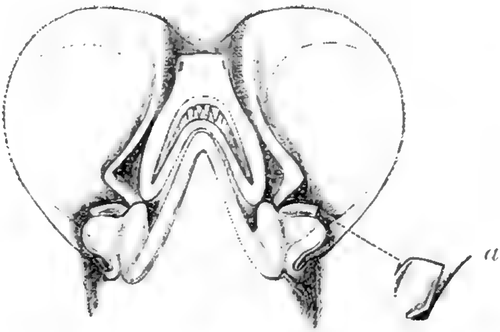
Ears very large, rounded, laid forward they extend quite a quarter of an inch beyond the tip of the muzzle; their inner bases united on the muzzle; their substance comparatively thin and transparent; keel of the conch scarcely thickened below; antitragus very high

[1] Preliminary descriptions of the new species were published in Ann. & Mag. N. H. (6) vii. p. 303 (1891).

[2] N. Giorn. Lett. p. 230 (1825).

[3] Précis découv. somiol. p. 12 (1814)

posteriorly, the notch behind it more than 5 millim. deep, as compared to about 3 millim. in the two allied species. Tragus large and broad, quadrangular, its tip sharply angular, and its outer upper border long and straight. Lips apparently not deeply wrinkled. Gular sac apparently present. Pads at base of thumb distinct. Lower incisors 4. Colour everywhere above, and on the chin, shoulders, and sides of thorax below dark brown; chest, belly, base of tail, and thighs to below knees pure white.



Nyctinomus lobatus.
Under surface of head, showing ears and antitragus. *a*, tragus. Nat. size.

Dimensions:—Head and body 77 millim., tail 56; tail free from membrane 30; ears, length from base of post-antitragal notch to tip 30; forearm 63 (=2·47 in.).

This fine new Bat is distinguished at once from all the other species of the genus, except *N. miarensis*, Grand., and the two above-mentioned, by its much greater size, none of them having a forearm exceeding two inches in length. *N. miarensis* is at once separated by its structural characters and is not really allied to *N. lobatus*. Of the two species to which it is allied, *N. africanus* is a native of the Transvaal, and *N. tæniotis* of Abyssinia[1], extending northwards over a great part of the Palæarctic region: the new form is therefore intermediate between them in habitat as in many of its characters; but there can be no question as to the specific distinctness of all three.

6. SCIURUS RUFOBRACHIATUS, Waterh.

a. Mount Elgon, in thick forest. 6000 ft. 25/2/90.
b. Mount Elgon, in thick forest. 22/1/90.
c. Mount Elgon.
d. Savi, Mount Elgon. 14/2/90.

This is a typically West-African species, and its occurrence on Mount Elgon still further extends its known range to the eastward

[1] The Abyssinian *N. midas*, Sund., and *N. ventralis*, Heugl., are unquestionably, as Mr. Dobson has shown, synonymous with *N. tæniotis*.

beyond that already recorded in the two papers on Emin's Mammalia[1].

7. Sciurus annulatus, Desm.

a, b. Two specimens.

8. Sciurus cepapi, Smith.

a, b. ♂. Kikuyu.
c. ♀. Kikuyu.
d. ♀.

9. Xerus erythropus, Geoffr.

a. One specimen.

10. Otomys irroratus, Bts.

a–e. Mianzini. 8/89.

These five skins exemplify very well the considerable variation in colour to which this species is subject, two of them being dark umber-brown, two dark sandy fawn, and the fifth grey, with a wash of brown on the head and centre of back. These differences, however, may be due merely to age, as, judging by the skulls, the last described specimen is the youngest, and the first two the next in age of the set, the fawn-coloured specimens being therefore the oldest of all.

All the five have 7 laminæ in $\underline{\text{m.}^3}$ and 4 in $\overline{\text{m.}_1}$, and therefore confirm on the whole the conclusions come to by Prof. Barboza du Bocage[2] as to the identity of his *O. anchietæ*, which has 7–5 laminæ in the two teeth, with *O. irroratus* of S. Africa, which ordinarily has only 6–4. There may be perhaps a tendency to an increase northwards in the number of laminæ in the last upper molar, as S.-African specimens seem very rarely to attain the number found in all of the Mianzini ones, which are the most northern recorded.

11. Otomys jacksoni, sp. n. (Plate XV.)

a. Crater of Mt. Elgon, at 13,200 ft. 17/2/90. *Type*[3].
b, c (without skulls). Ditto.

Allied to *O. irroratus*, but readily distinguishable by the lower incisors having two deep grooves on their anterior faces instead of only one.

Size rather smaller than in *O. irroratus*; general form, as usual, very vole-like. Fur excessively long and soft, the general mass of the hairs on the back attaining a length of 18–20 millim.

[1] P. Z. S. 1888, p. 8, and 1890, p. 447. In the second of these two papers a misprint occurs (p. 446), which I may take this opportunity of correcting. The type specimen of *Anomalurus orientalis*, Peters, is there said to be in the *British* Museum, but it should, of course, have been *Berlin* Museum.

[2] J. Sci. Lisb. (2) iii. p. 206 (1889).

[3] The single skull, on which of course the species is really founded, was not definitely allocated to any one of the three skins; but in its size it appears to fit *a* the best, and as it certainly belongs to one or other of the three, the point is not of very great consequence.

Colour a coarsely grizzled brownish yellow mixed with black, the grizzling appearing all the coarser from the great length of the fur. Longer hairs on centre of back black-tipped, those on sides yellow-tipped. Bases of hairs all over, above and below, pale slaty grey for seven-eighths of their length; tips of belly-hairs dirty yellow. Ears, as usual, large and rounded. Tail short, bicolor, black along the top, shining greyish white along the sides and under surface.

Skull very much as in *O. irroratus*, but the bones rather lighter and more delicate.

Teeth. Upper incisors narrower and flatter in front than in *O. irroratus*; their anterior faces each with one deep groove in the position of that of *O. irroratus*, a faint internal one also as in that species, and between the two a third very faint and indistinct one, just flattening the part of the tooth that is most convex in the allied species. Lower incisors each with two deep and distinct grooves, the outer one clearly corresponding to the single groove in *O. irroratus*, the inner one running along the part that is so prominently convex in that species. Lamina formula of molars $\frac{3-2-7}{4-2-2}$, as in all the present set of *O. irroratus*.

Dimensions:—Head and body approximately 120 millim.; tail (of *b*, that of *a* being broken) 47; hind foot 25·5.

Skull. Basal length 31·4, greatest breadth 18·1; nasals, length 16, breadth 6·2; interorbital breadth 4; interparietal, length 4·9, breadth 9·5; anterior palatine foramen 6·5; diastema 7·7; length of upper molar series (crowns only) 7·8; combined breadth of upper incisors 3·6; lower jaw, condyle to incisor tip 23·8.

As already shown, the more numerously grooved incisors separate this new species at once from *O. irroratus*, while *O. brantsii*, Smith, and *O. unisulcatus*, F. Cuv., the only other species recognized, have incisors even less grooved than in the form to which I have compared it. It represents therefore a most interesting step towards *Oreomys typus*, Heugl.[1], a native of the high mountains of Abyssinia, which has no less than three deep grooves on each of its incisors, and a lamina formula of $\frac{3-2-8}{4-2-2}$[2]; in fact its discovery may necessitate the union of "*Oreomys*" with *Otomys*, the number of incisor grooves being in this group evidently not a generic, but only a specific character. Without having examined a specimen of Heuglin's animal, however, and only from his description, I do not care for the present definitely to abolish the genus.

This striking new species is one of the many important zoological discoveries made by Mr. Jackson during his ascent of Mount Elgon in January 1890, and it is with much pleasure that I connect with it the name of so distinguished an explorer and naturalist as he has proved himself to be.

[1] Reise N.O.-Afr. ii. p. 76 (1877).

[2] Heuglin, in his description, stated that there were 4 upper molars present in *Oreomys*, with a lamina formula of 3–2–3–5; but he had evidently mistaken the long posterior tooth for two, and I have therefore corrected his formula into that above given.

12. Mus dolichurus, Smuts.

a–d. ♀ and 3 young ones. Mount Elgon. 2/90.

"Found in a Barbet's nest in a hole in a tree in thick forest."

Mus arborarius, Peters [1], originally described from the Zambezi, and recorded by Pagenstecher from Mguruman, Masai-land, is no doubt synonymous with the earlier described *M. dolichurus* [2]. So also, in all probability, is the same author's *M. rutilans* [3] from the Cameroons, while a specimen from Fayum, Egypt, in the Berlin Museum, which is marked "*Mus argillosus*, Licht." [4], appears also to be the present form. The species therefore ranges over the whole of Africa, from Egypt to the Cape, although it is evidently very rare, as so few specimens have been brought to Europe.

The three young ones, taken from the nest by Mr. Jackson, are clothed with straight crisp hairs above and are nearly naked below; their upper surfaces are of a dark mouse-grey colour with prominent yellowish patches behind the ears; their chins, chests, and bellies are bordered with bright cream-colour. As in other long-tailed species, the tails of the young are comparatively short, barely equalling the length of the body without the head.

13. Mus (Isomys) abyssinicus, Rüpp.

a, b. Turquel, Sük. 1/90.

14. Mus (Isomys) pumilio, Sparrm.

a, b. Mianzini. 8/89.

15. Rhizomys annectens, sp. n.

a. Ad. ♂. *Type* of species.
(?) *b, c.* Yg. Mianzini. 8/89.

Like *R. splendens*, Rüpp., but considerably larger, although not attaining the size of *R. macrocephalus*, Rüpp.

Dimensions of *a*:—Head and body (circa) 240 millim.; tail 45; hind foot, without claws 29, with claws 33.

Skull dimensions:—Basion to gnathion 51; basion to front surface of one of the incisors 52; zygomatic breadth 39·4; nasals, length 21, greatest breadth 7·6; breadth between outer corners of infra-orbital foramina 15·3; diastema 21·5; combined breadth of upper incisors 8·2; length of upper molar series (crowns only) 10·0. Lower jaw, length (bone only) 36; back of condyles to incisor tips 43·5.

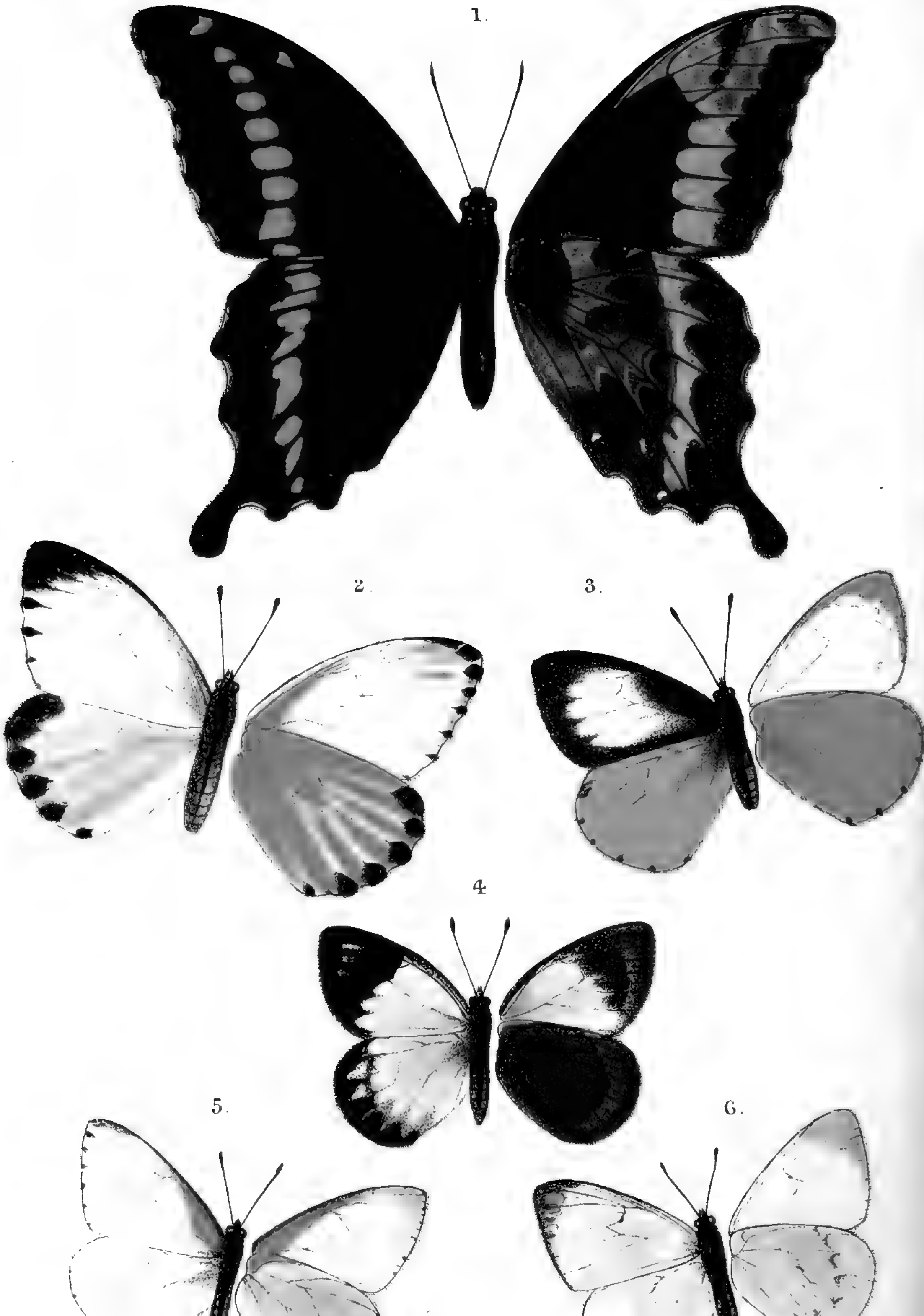
The basal length of the skull of *R. macrocephalus* appears, from Rüppell's figures, to be about 63 millim., while that of the largest of six specimens of *R. splendens* in the British Museum is only 41.

[1] Säugeth. Mossamb. p. 152 (1852).

[2] En. Mamm. Cap. p. 38 (1832).

[3] MB. Ak. Berl. 1876, p. 478. The type of this species is said to have only 0—2=4 mammæ; but this is probably an abnormality, as there is a specimen in the Museum from the Niger with the usual number, 1—2=6.

[4] No description published, so far as I can ascertain. The specimen was collected by Hemprich and Ehrenberg.



M.H. Fisher del et lith.

Mintern Bros. Chromo.

NEW BUTTERFLIES FROM BRITISH EAST AFRICA.

H. M. Fisher del et lith. Mintern Bros. Chromo.

NEW BUTTERFLIES FROM BRITISH EAST AFRICA.

The three species therefore form a gradational series, all extraordinarily alike externally, and merely differing in the sizes of their skulls.

Mr. Jackson's discovery of this interesting connecting-link in the genus is the more remarkable as *R. splendens* has been found both to the north of its habitat, in Abyssinia, and to the south, on and near Mt. Kilimanjaro, whence Mr. H. C. V. Hunter obtained four specimens in 1888, which he was good enough to present to the National Collection. These specimens are quite identical with Abyssinian examples.

It may just be mentioned, although probably of but little importance, that *R. annectens* has not the darker muzzle ordinarily present in *R. splendens*, that it has a paler tail, and that its bullæ appear to be proportionally rather smaller.

Specimens *b* and *c* are too young to be determined with absolute certainty, at least until the exact local ranges of *R. annectens* and *R. splendens* are known. They are remarkable for their very long, soft and silky hair, and their peculiar bluey-grey colour, utterly unlike the reddish-brown characteristic of the adult. In fact, without the skulls, one might have been excused for looking upon them as representing a totally distinct form.

2. Descriptions of New Butterflies collected by Mr. F. J. Jackson, F.Z.S., in British East Africa, during his recent Expedition.—Part I. By Emily Mary Sharpe.

[Received March 3, 1891.]

(Plates XVI. & XVII.)

This paper records the names of some new species of *Papilionidæ*, *Pieridæ*, and *Acræidæ* discovered by Mr. F. J. Jackson in the Kikuyu and Sotik districts and on Mount Elgon. I shall hope, later on, to give an account of the entire collection made by Mr. Jackson in these regions; but as it contains a number of *Lycænidæ*, this project will take some little time to accomplish, as the working out of the last-named family is a very difficult matter.

Subfam. Papilioninæ.

1. Papilio mackinnoni, sp. n. (Plate XVI. fig. 1.)

Nearest to *P. constantinus* of Ward, from Ribé (Afr. Lepid., part i. pl. i. figs. 1, 2), but easily distinguished by the position of the ochreous band across both wings, the absence of the submarginal row of yellow markings, and by the want of the large oval spot in the discoidal cell.

General colour rich brown, almost black, with all the spots and markings ochreous.

Fore wing. Hind margin scalloped with a half-circular edging of ochreous between each nervule. From the costa, near the apex, is a row of nine ovate yellow spots forming a transverse band down to the inner margin, the spots distinctly separated from each other by a line of brown, marking each nervule; the spots on the disk below the radial and median nervules being much larger. Between the second and third subcostal nervules, and situated at the base of these two nervules, is a small hastate spot, smaller in size than in *P. constantinus* and nearly obsolete.

Hind wing. Similar to the fore wing in colour and markings, the transverse band of ochreous spots being continued in the same line as on the latter; the hind margin similarly scalloped with a fringe of ochre between the nervules, the tail being scalloped on the inside only.

The ochreous markings on the hind wing are more longitudinal in form than on the fore wing: those of the disk are in the form of longitudinally-ovate twin spots, between which is a scarcely visible line of brown; the spot near the anal angle very small and rounded.

Underside. Resembles the upper surface in general character of its colour and bands, but the transverse band on the hind wing is of a pearly appearance.

The general colour of the under surface is dark brown, but there are irregular mottlings of lighter brown on the basal area of the hind wing, causing the darker brown ground-colour to take the form of a band in continuation of the ochreous band, which does not extend higher than the second radial nervule.

Exp. $4\frac{1}{2}$ inches.

Hab. Between Sotik and Kavirondo, Oct. 1889.

The female is very similar to the male in colour, but the ochreous markings are larger, especially on the hind wing, where they form a broad band composed of entire (not twin) spots, which are obtusely oval towards the base of the wing and scalloped towards the hind margin.

Exp. $4\frac{1}{2}$ inches.

Hab. Kikuyu, August 1889.

2. Papilio jacksoni, sp. n. (Plate XVII. figs. 1, 2.)

Nearest to *P. cynorta* of Fabricius, but differing in the white band of the fore wing, which, instead of being continuous with that of the hind wing, is broken up into spots.

General colour black, with white bands, spots, and markings.

Fore wing. Hind margin obsoletely scalloped with a white fringe between the nervules, a transverse row of eight spots slanting from the apex towards the inner margin, those between the radial and median nervules much smaller and more hastate in shape than in *P. cynorta*; the submedian spot of white consisting of a twin spot longitudinal in shape. Below the discoidal cell, the areas of the wing adjoining the nervules are marked by a shade of ashy brown, the texture of the wing at the same time being hirsute.

Hind wing. Hind margin distinctly scalloped with white between the nervules; a submarginal row of five white spots, rounded in shape, four on the disk and one above the second subcostal nervule: the basal area somewhat browner and followed by a broad oblique transverse band of yellowish white.

Underside. Fore wing blackish, the transverse row of white ovate spots distinctly marked, but becoming obsolete towards the apex, where there is a distinct shade of ashy; on the upper fore margin of the discoidal cell is an indistinct spot of white.

Hind wing light brown, darkening towards the apex and across the disk; the white spots not so distinct as on the upper surface, the middle one of the five being obsolete; between the second subcostal nervule and the radial nervule is an additional spot of white; basal area rufous, with a spot and streak of black above the subcostal nervure; the discoidal cell with three black lines; the rufous base followed by a white band not so distinct as on the upperside of the wing, and shaded with lilac under certain lights.

Exp. 4 inches.

Hab. Between Sotik and Kavirondo, Sept. 1889.

The female is rather larger than the male, and is distinguished by the patch of rufous ochre which takes the place of the white transverse band of the male. There is a submarginal row of six white spots on the hind wing, instead of five as in the male. Instead of the band of longitudinal spots on the fore wing of the male, the female has a submarginal row of rounded white spots differing in size, five in number in a continuous series, confined to the disk, absent between the fourth and fifth subcostal nervules and between the latter and the first radial, but re-occurring between the third and fourth subcostal nervules near the apex. There are three irregular large white spots, one triangular on the upper margin of the discoidal cell, another below the cell, ovate in shape, between the first and second median nervules, and the third, a twin spot of irregular shape, at the base of the fifth subcostal and first radial nervules.

Exp. $4\frac{1}{4}$ inches.

Hab. Kikuyu, Sept. 1889.

This species is also nearly allied to *P. echerioides* of Trimen (*cf.* S. Afr. Butterfl. iii. p. 255), a species figured in the 'Transactions of the Entomological Society' for 1868 (p. 72, pl. vi. figs. 1, 2).

The position of the white spots on both wings is quite different, and both spots and bands are white, not yellowish white as described by Dr. Trimen.

Subfam. PIERINÆ.

3. MYLOTHRIS WINTONIANA, sp. n. (Plate XVI. fig. 2.)

Female. Similar to the female *M. clarissa* of Butler, and with a yellowish hind wing as in that species, but with a very much broader blackish border.

Fore wing white, the basal area pinkish; costal margin and an oblique patch on the apex blackish, with four triangular spots on the hind margin diminishing in size towards the posterior angle, the spot at the end of the submedian nervure being very minute, those at the end of the three median nervules becoming gradually larger, and the mark at the end of the radial nervules being confluent with the blackish apex.

Hind wing creamy ochreous, with a pinkish tinge on the basal area, the hind margin scalloped with a white fringe, before which a broad band of black, confluent at the end of the subcostal and radial nervules, and succeeded by a large rounded spot of black at the end of each median nervule. At the end of the submedian nervure is a small spot of black, the adjoining portion of the wing being shaded with orange.

Underside. Fore wing pearly white, rich orange at the base, and shaded with orange-yellow towards the apex, with a distinct row of black spots on the hind margin of the wing, and extending round the apex till they become evanescent on the costal margin.

Hind wing orange-yellow, a little deeper in colour near the base; the hinder margin with a row of large black rounded spots.

Exp. 4 inches.

Hab. Kavirondo, Oct. 1889.

4. MYLOTHRIS JACKSONI, sp. n. (Plate XVI. fig. 3.)

Nearest to *M. narcissus* of Butler (P. Z. S. 1888, p. 95), from Kilimanjaro, but differing in the broad black border, which extends along the inner margin to the base of the fore wing.

Fore wing white, with a complete black border all round, the base black, with a swollen area of black, extending from the base along the upper margin of the discoidal cell to the middle of the costal border, where the black costal margin is decidedly narrower; the border on the hind margin denticulated on its inner edge.

Hind wing bright sulphur-yellow, with tiny black spots marking the end of each nervule on the hind margin; and with a broad black streak, extending along the edge of the wing from the apex to about the end of the subcostal nervule.

Underside. Fore wing white, with the costal margin black, becoming yellow towards the apex, which continues yellow as far as the third median nervule. Each nervule is marked by a tiny black spot on the hind margin; these spots are more distinct on the hind wing, which is entirely sulphur-yellow.

Exp. $2\frac{3}{4}$ inches.

Hab. Kavirondo, Oct. 1889; Kikuyu, Aug. 1889.

5. MYLOTHRIS MACKENZIANA, sp. n. (Plate XVI. fig. 5.)

Nearest to *M. rueppelli* of Koch, but with no yellow at the base of the hind wing; the orange of the fore wing much more restricted and extending in an oblique patch across the basal third of the discoidal cell to the costal margin; the latter is black; there is no apical patch, but the costal margin shows two confluent black spots near the apex, and each nervule is marked with a tiny black spot on the hind margin as far as the first median nervule.

Hind wing white, with a tiny black spot at the end of each nervule on the hind margin.

Underside considerably different from that of *M. rueppelli,* the hinder wing and the apex of the fore wing being ochreous, each nervule being represented on the hind margin by a spot of black; the base of the fore wing with an oblique mark of bright orange as on the upper surface, but this orange mark is extended much further along the costal border and reaches beyond the limit of the discoidal cell.

Exp. $2\frac{3}{4}$ inches.

Hab. Kavirondo, Oct. 1889.

6. TERACOLUS ELGONENSIS, sp. n. (Plate XVI. fig. 6.)

General colour greenish white, with a small black spot at the end of the discoidal cell. The costal margin is narrowly edged with black, which is much broader at the apex, and continues along the hind margin, decreasing in width towards the submedian nervure, where the black terminates. Near the apex, between the third subcostal and first radial nervules, is an ovate spot of deep crimson followed by two other spots smaller in size, the last being nearly obsolete. At the base near the inner margin is a slight shading of grey. The hind wing is greenish white with no visible markings.

Underside. Fore wing white, with the costal margin, hind margin, and apical portion pale yellow, the small black spot at the end of the discoidal cell visible.

Hind wing entirely pale yellow, the costal margin narrowly edged with orange; a small streak of black is very distinct at the end of the cell; from the end of the costa to the submedian nervure is a half-circle of light brown spots between the nervules.

Exp. 3 inches.

Hab. Mount Elgon, Feb. 1890.

7. BELENOIS MARGARITACEA, sp. n. (Plate XVI. fig. 4.)

Fore wing with more than the basal half pearly white, the apical portion of the wing with the costal margin black, this black extending to the posterior angle but becoming much narrower in this direction. Some slight indications of subapical whitish streaks.

Hind wing pearly white with a bluish reflexion; the hind margin with a tolerably broad band of black indented by subterminal spots of bluish white, becoming smaller and more longitudinal between the first and second median nervules, and becoming obsolete above the submedian nervure.

Underside. Fore wing with the basal portion white, with a yellowish tinge, inclining to pale orange near the extreme base; costal margin and apical portion of the wing black, inclining to bronzy black at the apex and on the hind margin; this leaves a subterminal band of deeper black bordering the white area.

Hind wing bronzy black, with a spot of orange-yellow before the apex, and with a slight edging of yellow near the base of the costa; a slight indication of a paler subterminal shade of bronzy brown along the hind margin.

Exp. 2 inches.

Hab. Sotik, Sept. 1889.

Allied to *B. raffrayi* of Oberthür (*cf.* Études d'Entomologie, p. 17, pls. i. & iii.).

Subfam. Acræinæ.

8. Acræa excelsior, sp. n. (Plate XVII. fig. 3.)

Of the same group as *A. bonasia,* but with a yellow subapical patch on the fore wing and a yellow patch on the hind wing. The underside differs from that of any species of *Acræa* which I have yet seen.

Fore wing. A large basal area of deep orange-rufous extending over two thirds of the cell and over all but the hind margin of the disc, so that it occupies the major portion of the wing. The base black, extending as a broad border along the costal margin to the apex, and round the hinder margin and along the inner margin, though here it is much narrower; where the rufous portion touches the black which borders it, there is a slight indication of a yellow intermediate line, near the costal margin and the outer posterior and inner marginal border. The subapical patch of pale yellow is tinged with rufous, and in shape is long and oval, extending from near the costal margin almost to the hind margin, crossing the base of the subcostal nervules and radial nervules almost to the posterior margin of the third median nervule. This yellow patch is separated from the rufous area by a black band from the costa to the hind margin.

Hind wing. Basal area black, with a rufous spot above the subcostal nervure; the centre of the wing crossed by a broad band of yellow, from the costa to the inner margin, washed with rufous towards the former and above the disk; the hind margin with a broad black band which occupies, at least, a quarter of the wing.

Under surface. More than the basal half orange-rufous, streaked with yellow at the base and along the costal margin, which is otherwise dusky black as well as the apex and hind margin of the wing, the latter narrowing towards the anal angle and ornamented with a mesial streak of crimson on the hinder margin between each nervule. A yellow subapical patch is enclosed by a band of black, exactly as on the upper surface.

Hind wing. Beautifully varied with yellow and crimson, the greater part of the wing being yellow. The base is crimson, enclosed in a triangular line of black, with a white spot at the base of the internal nervure. About the middle of the costal border is another triangular patch of crimson, enclosed by black, reaching to the hind margin of the discoidal cell. The hind margin of the wing is occupied by a broad border coequal with that of the upper surface, the nervules marked by a broad line of ashy black, the intervening spaces being crimson with a well-marked subterminal spot of white, the hind margin being fringed with black.

Exp. 2 inches.
Hab. Kikuyu, Sept. 1889.

9. Acræa melanoxantha, sp. n. (Plate XVII. fig. 4.)

Black and yellow as in *A. circeis*, which it somewhat resembles, especially on the underside; it is, however, much smaller, and has fewer transparencies on the fore wing.

Fore wing black, with a double row of spots; two are twin-spots, one being at the posterior end of the cell, and the other adjoining it at the base of the disk, between the first and second median nervules. These two spots are irregularly oblong in shape and of a yellow colour. A second row of subapical spots consists of three, also irregularly oblong in shape, but transparent white; these are situated in juxtaposition, below the fifth subcostal and second radial nervules.

Hind wing blackish, with a patch of yellow, irregular in shape, occupying the middle of the wing. The basal area of the wing is black, extending in a black band along the costal margin, which joins the broad black border of the hind margin. The yellow colour of the hind wing reaches to the inner margin about its centre; the black nervules are indicated plainly as they cross the yellow area, and two black spots are also visible on the yellow of the upper margin of the discoidal cell.

Underside. Fore wing ashy brown for the basal two thirds, the white spot of the upperside indicated below, with a dusky spot at the base of the fifth subcostal nervule; apical area and hind margin of the wing coppery bronze, each interspace with a black mesial line, the nervules also marked out in black; the hind margin fringed with black.

Hind wing. Basal area ochreous yellow, deeper near the base, all this pale area numerously dotted with black spots, clustering nearer to the base and on the inner margin; hind margin with a broad band of coppery bronze, with the same mesial line of black and the black lines of the nervules also strongly indicated; the hinder margin fringed with black.

Exp. 2 inches.
Hab. Mount Elgon, Feb. 1890.

10. Acræa oreas, sp. n. (Plate XVII. fig. 5.)

Resembling *A. melanoxantha* on the upper surface, with two rows of triple white spots, the subapical ones, however, not being transparent. The hind wing is further different in the yellow central patch being entirely shut in by black. The under surface, however, is totally different from that of *A. melanoxantha* and is more in the style of *A. cabira.*

Fore wing. Upper surface black, with two rows of oblong white spots: one row about the middle of the wing consisting of three dissociated spots, one in the middle of the cell, a second below the base of the second median nervule, and the third near the hind margin below the first median nervule. The second row of white spots are subapical, two spots being close together below the fifth subcostal nervule, the second between the first radial, while the third is a little further off near the hind margin, below the second radial nervule.

Hind wing black, enclosing a large yellow area which reaches from near the base of the wing, spreads over the cell, and occupies the basal third of the disk.

Underside. Fore wing dusky, the apex somewhat reddish; the base buff chestnut, extending along the basal edge of the costal margin. The white spots of the upper surface indicated by pearly-white spots below.

Hind wing. Bright chestnut at the base, with tiny dots of black, followed by a yellow mesial area, almost coextensive with the same area on the upper surface, but reaching to the inner margin of the wing behind the chestnut, which has sharply quadrate borders on its hinder aspect; the whole of the hind margin bronzy brown with a reddish tinge, forming a very broad band, the nervules marked by black lines, with a mesial line of black between each nervule to the hind margin.

Exp. $2\frac{1}{4}$ inches.

Hab. Mount Elgon, Feb. 1890.

DESCRIPTION OF THE PLATES.

Plate XVI.

Fig. 1. *Papilio mackinnoni*, sp. n., p. 187.
2. *Mylothris wintoniana*, sp. n., p. 189.
3. *Mylothris jacksoni*, sp. n., p. 190.
4. *Belenois margaritacea*, sp. n., p. 191.
5. *Mylothris mackenziana*, sp. n., p. 190.
6. *Teracolus elgonensis*, sp. n., p. 191.

Plate XVII.

Fig. 1. *Papilio jacksoni*, sp. n., ♂, p. 188.
2. *Papilio jacksoni*, sp. n., ♀, p. 188.
3. *Acræa excelsior*, sp. n., p. 192.
4. *Acræa melanoxantha*, sp. n., p. 193.
5. *Acræa oreas*, sp. n., p. 193.

3. On the Comparative Osteology of the United States *Columbidæ*. By R. W. Shufeldt, C.M.Z.S.

[Received February 2, 1891.]

Opportunity has recently been afforded me to compare together examples of the skeletons of the following species of Pigeons of our avifauna, viz.:—*Ectopistes migratorius*, *Zenaidura macroura*, *Engyptila albifrons*, *Melopelia leucoptera*, *Columbigallina passerina*, *Scardofella inca*, and *Starnœnas cyanocephala*. I have also had at hand during this work skeletons of several of our domesticated varieties, a large series of skeletons of nearly all our gallinaceous birds, and the published accounts of the osteology of many forms of columbine types, such as have been described by the Newtons, by the Parkers, by Fürbringer, and by many others [1].

So far as I have examined them, then, I find the Pigeons of this country to be :—

1. Completely schizognathous birds ; and with elongated narial apertures in the skull, which are not separated by an osseous septum nasi.
2. A large lacrymal bone is present, which fuses extensively with the *pars plana*, thus forming an unbroken plate.
3. With large vacuities in the anterior wall of the brain-case, the lower one of which merges with a big one in the interorbital septum.
4. Zygoma very slender.
5. Basipterygoid processes present, which may (in all save *Ectopistes* ?) or may not articulate with the short pterygoids ; the latter not in contact in the middle line anteriorly.
6. Palatines very slender, with their laminæ somewhat reduced, and with their postero-external angles completely rounded off.
7. Maxillo-palatines antero-posteriorly elongated, internally spongy, and fused with the prepalatines, the maxillary, and the premaxillary.
8. The premaxillary process of the nasal bone carried far forwards, beneath the osseous culmen.
9. Sphenoidal rostrum sharp in front, thick and rounded behind.
10. Vomer may or may not be present (?). Huxley figures the palate of *Columba palumbus*, and says "the vomer is very slender" (P. Z. S. 1867, p. 434) ; Parker says the Pigeons are without a vomer.
11. Quadrates typically ornithic, and with two transversely disposed facettes for articulation with mandible.
12. Mandible V-shaped, its symphysis short and feeble ; articulatory ends transversely truncated posteriorly, from above, downwards and forwards ; ramal vacuity may (*Ectopistes*) or may not (*Starnœnas*) be present.
13. Eighteen (*Ectopistes*) or nineteen (*Starnœnas*) vertebræ in the spinal column between the skull and pelvis. Three leading dorsal vertebræ fuse together to form one bone (*Ectopistes*), and with it may fuse the ultimate cervical (*Melopelia*). Five (*Starnœnas*) or six (*Ectopistes*) free caudal vertebræ. A good-sized pygostyle present. Pelvis broad and shallow ; no prepubic spine present.
14. Os furcula U-shaped ; without hypocleidium, and very slender.

[1] To the U.S. National Museum, and to Mr. F. A. Lucas of that Institution, I am indebted for the use of a skeleton of *Ectopistes* and one of *Columbigallina passerina* ; one of the assistants also, Mr. Schollick, has presented me with a skeleton of the domesticated Pigeon known by the name of the "Archangel." Mr. J. S. Singley of Giddings, Texas, has likewise forwarded me several valuable specimens. My private cabinet also contains numerous skeletons of our various species of *Columbidæ*.

15. Sternum large, with very deep carina; two pairs of flaring xiphoidal processes, usually making the bone 4-notched, but the posterior or more inconspicuous internal pair of xiphoidal processes may unite by their extremities with the mid-xiphoidal prolongation and thus create fenestræ behind. Manubrium small. Corpus sterni often narrow for its entire length. Usually four articular facettes upon each costal border.
16. The *humerus* is straight, pneumatic, and its radial crest is triangular in form. The *radius* is straight and the *ulna* is bowed.
17. Trochanter of *femur* elevated above the summit of the shaft. *Patella* may be very small and in two pieces, or it may be larger with a single minute piece near it (*Starnœnas*). Ossific centres in tibial cartilage.
18. Hypotarsus of *tarso-metatarsus* of short cubical form, and is both pierced and grooved for the passage of tendons. *Hallux* on a level with the other toes, and its metatarsal peculiarly twisted. Phalanges of pes 2, 3, 4, 5 for the 1st to 4th toes respectively.

Conclusions.

Our Suborder of *Columbæ* in the United States contains but one family—the *Columbidæ*. Whether the Quail-Doves of the genus *Starnœnas* should be awarded a subfamily of the *Columbidæ* can only be settled when we are in possession of a full knowledge of their anatomy. So far as the osteology of *Starnœnas cyanocephala* goes, it would seem to indicate that a subfamily line separates it from our other Pigeons [1].

One of the best established facts in ornithology is that the *Columbidæ* are nearly related to the great gallinaceous group of birds, so then the nearest relatives they have in our avifauna are the *Tetraonidæ*, especially the Grouse. Then beyond them are the *Cracidæ* and Turkeys. Huxley has said (P. Z. S. 1867, p. 460) that "on the other side they seem to be allied with the Owls and Vultures." Such affinities, however, must be quite remote. There is no question about the links that connect the Columbine types with the Grouse and Ptarmigans (*Lagopus*), for they are most perfectly seen in the Sand-Grouse, holding as these latter do a morphological position directly between them. The Plovers are not so far off in another direction, and *Tinamus* and *Hemipodius* have also distant claims to kinship. The extinct Dodo and the existing *Didunculus* of Samoa show other and perhaps nearer relations. Fossil remains of Pigeons, so far as the present writer is aware, have not as yet been found in this country, though those of several species of Turkeys have.

[1] With its enormous sternum, its differently constituted vertebral column, and a number of other points, it will at once be seen that, osteologically, *Starnœnas* is quite different from any of our other Pigeons. These characters are also supported by others already pointed out by Coues (Key, 2nd ed. p. 571), who has created for it the subfamily *Starnœnadinæ*, and I am strongly inclined to believe he is right.

March 17, 1891.

Prof. G. B. Howes, F.Z.S., in the Chair.

Mr. Sclater exhibited two specimens of the horns, with scalps attached, of an Antelope from Somali-land which he had received from his correspondent Capt. H. G. C. Swayne, R.E.

Writing from Berbera (February 11th, 1891), Capt. Swayne stated that the specimens had been lately given to him by some Dolbohanta Somalis (see map in James's 'Unknown Horn of Africa,' where the district of Dolbohanta is marked to the S.E. of Berbera about 100 miles distant), who had brought them from the interior, and told him that this "kind of Gazelle" was not found anywhere near the coast-line. Its size was said to be "about the same as that of Waller's Gazelle, which is found all over Somali-land." Its Somali name was "Dip-tag."

Capt. Swayne was starting next day on a shooting expedition into the Dolbohanta country, where he hoped to meet with this Antelope and to be able to send better specimens.

Mr. Sclater stated that, with the kind permission of Mr. Oldfield Thomas, he had compared the present specimens with the skull upon which Mr. Thomas had just founded his *Cervicapra clarkei* (Ann. & Mag. Nat. Hist. 1891, vii. p. 304), and that there was no doubt that they all belonged to the same species. But Mr. Sclater could not at all agree with Mr. Thomas that the Antelope in question was a *Cervicapra*. It appeared to him to be rather one of the Desert Antelopes allied to *Gazella*, and, judging from the form of the cranium shown in Mr. Thomas's specimen, to be probably allied to Waller's Gazelle (*Lithocranius walleri*).

Mr. Sclater exhibited two skins of the Ounce (*Felis uncia*) in reference to the specimen of this Cat lately acquired by the Society [1], and made some remarks on its distribution, which appeared to be entirely confined to the High Plateau of Central Asia. From the Himalayas it undoubtedly extended north of the Altai and into Amur-land and the island of Saghalin (*cf.* Schrenck, Amur-Reisen, vol. i. p. 96). But the story of its occurrence in Asia Minor, invented by Mr. D. G. Elliot, had now been quite upset by Messrs. Danford and Alston (see P. Z. S. 1880, p. 51). Nevertheless, Mr. Sclater had thought it would be of interest to get a living specimen of the so-called *Felis tulliana*, from the mountains above Smyrna, and had consequently applied to Mr. Frederic Holmwood, F.Z.S., at present H.B.M.'s Consul General at Smyrna, to use his best endeavours to obtain an example of this animal.

The following papers were read:—

[1] See below, p. 212.

1. Note on some Dermal Plates of *Homosteus* from the Old Red Sandstone of Caithness. By A. Smith Woodward, F.Z.S., of the British Museum (Natural History).

[Received March 2, 1891.]

So much is now known concerning the dorsal shield of the large armoured fish *Homosteus*, from the Old Red Sandstone of N. Scotland and N.W. Russia, that little remains to be added beyond points of detail concerning the form of the various plates. The ventral shield, however, is still unrecognized, and much has yet to be determined in connection with the facial bones. Existing knowledge of the subject is due chiefly to the researches of Hugh Miller[1], Asmuss[2], Pander[3], and Traquair[4]; and further advances can only be made by the discovery of additional specimens.

For one such discovery, which makes known a few novel features of interest, the writer is indebted to Mr. Donald Calder, of Thurso, who has recently forwarded to him an associated group of five dermal plates of *Homosteus milleri* from the Thurso flagstones. The three occipital plates are isolated and beautifully exhibited from the visceral aspect; a smaller, bilaterally symmetrical plate, also exposed from the visceral face, seems to be the anterior median ventral element; and another plate, with an adjacent fragment, is most probably one of the anterior ventro-laterals. The median occipital is shown in the accompanying drawing, fig. 1, p. 199, the left lateral occipital in fig. 2, the anterior median ventral in fig. 3, and an impression of the supposed left anterior ventro-lateral in fig. 4; all the figures being of one quarter of the natural size.

It has long been known that the median occipital plate in *Homosteus* overlaps the lateral occipitals to an enormous extent, but the precise limits of the great facette on each side have not been so clearly exhibited as in the new specimen (fig. 1, *f*). Except in the hinder two thirds of the anterior half, the overlapping surface is more extensive than the exposed visceral face; and in front, where the bone is very robust, it exhibits a pair of broad facettes (*f*), distinct from the lateral pair and thus evidently overlapping the central plates immediately in advance. The exposed median portion exhibits a longitudinal ridge arising shortly in front of the occipital border and soon bifurcating into a symmetrical pair of ridges, which

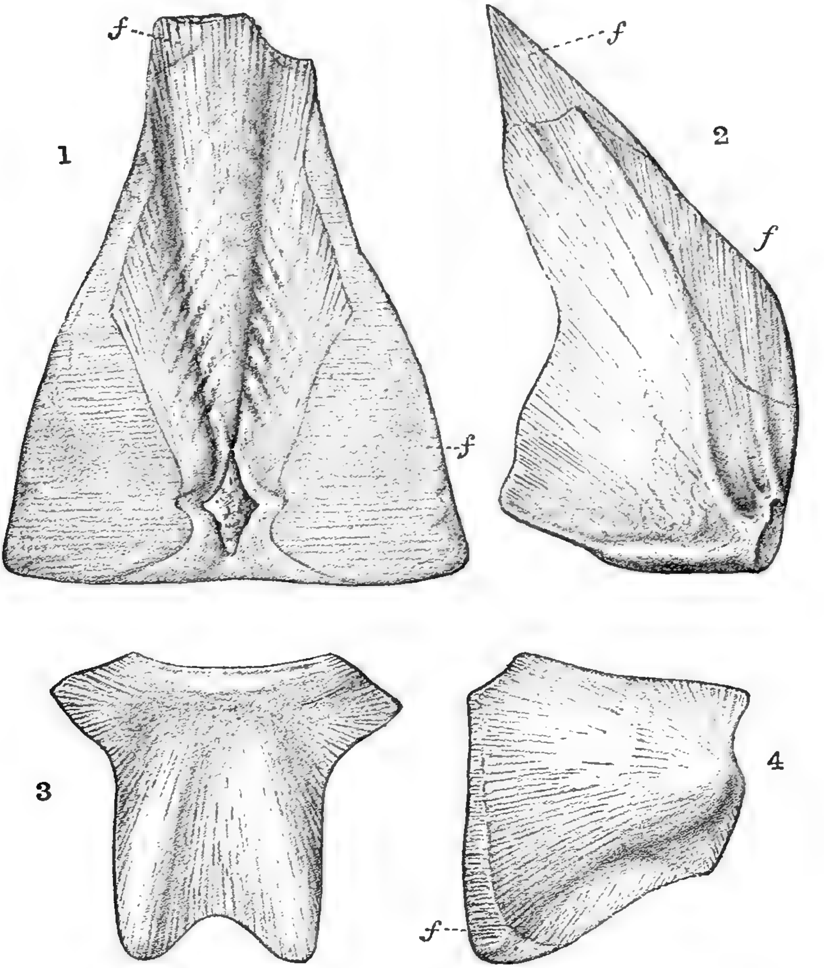
[1] H. Miller, 'Footprints of the Creator (1849), p. 70, figs. 24, 27–29, 36, 37, 39–41.

[2] H. Asmuss, 'Das vollkommenste Hautskelet der bisher bekannten Thierreihe' (Inaug. Dissert. Dorpat, 1856), pp. 8, 35.

[3] C. H. Pander, 'Die Placodermen des devonischen Systems' (1857), p. 74, pl. viii. figs. 2, 3, 6, 7.

[4] R. H. Traquair, "*Homosteus*, Asmuss, compared with *Coccosteus*, Agassiz," Geol. Mag. [3] vol. vi. (1889), p. 1, pl. i.

gradually diminish to the anterior third of the bone and then pass into broad undulations bounding a median longitudinal hollow. Posteriorly, where the two lateral occipitals approach most closely, the ridge is an arrowhead-shaped boss, the apex directed backwards and the base forwards; and at this point there may have been a descending plate of bone. At its bifurcation the ridge



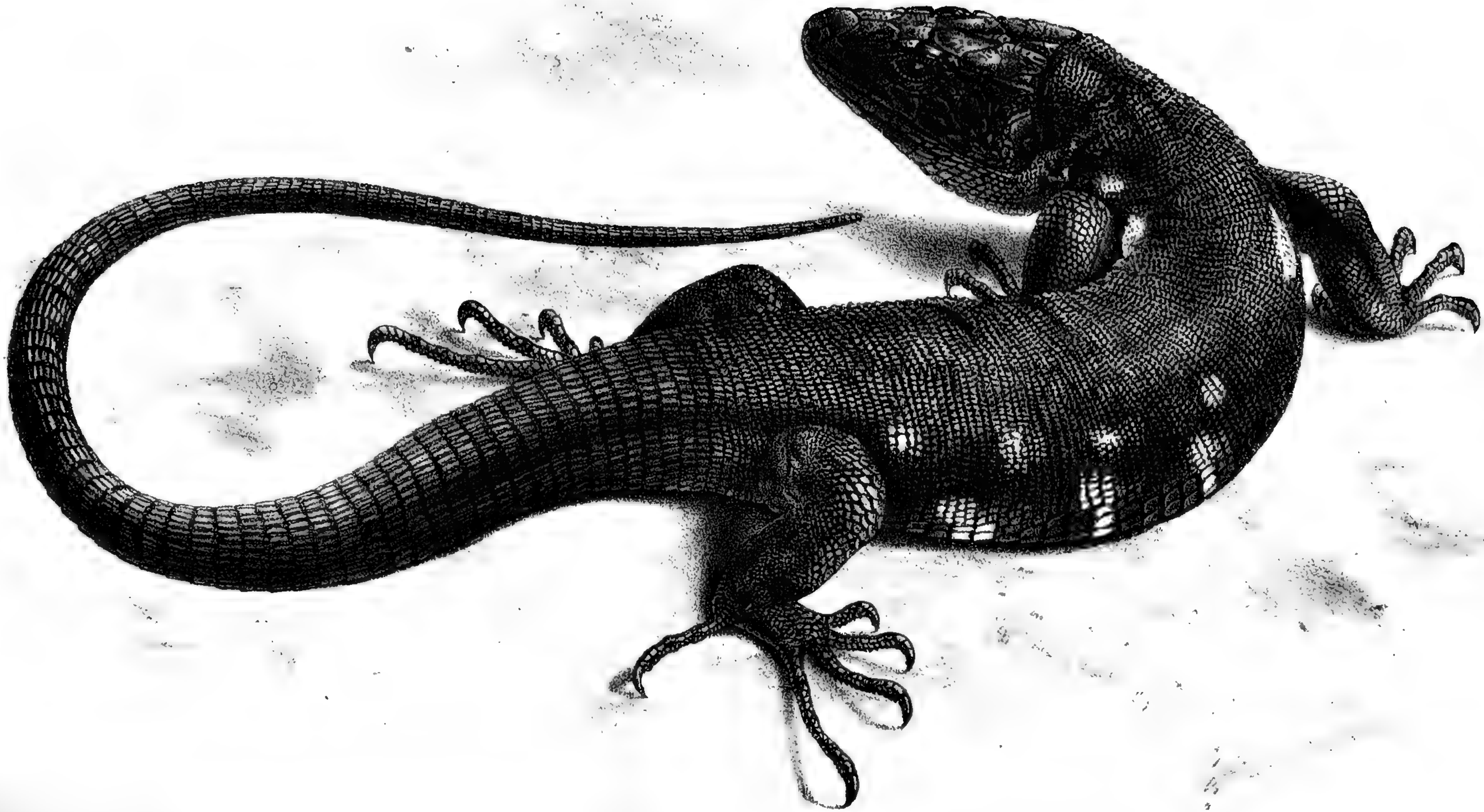
Figs. 1–4. Dermal plates of *Homosteus milleri*, from the Caithness Flagstones; all shown from the visceral aspect, of one quarter the natural size. 1, median occipital; 2, left lateral occipital; 3, anterior median ventral; 4, impression of left anterior ventro-lateral. *f*, facettes for overlap.

becomes much less elevated, broader and rounder, gradually diminishing forwards as just described; and on either side is a series of shallow, transverse linear grooves, symmetrically disposed in several pairs, all directed both backwards and outwards. These markings become very feeble anteriorly, and still await explanation; behind they are very suggestive of an impression of the anterior part of the spinal cord with its divergent nerves, but in front they appear rather as if corresponding to the septa between the myocommas of the muscular system. The brain itself would certainly have occupied a more anterior situation.

Both the lateral occipitals are well shown from the visceral aspect in the fossil, and that of the left side is represented in fig. 2. The postero-external angle and posterior border are much thickened for articulation with the dorso-lateral plate, but the specimen is somewhat fractured at this margin. A narrow lenticular facette (*f*) extending along the greater part of the outer border, and a large distinct facette (*f*) occupying the anterior apex of the bone, show that it overlapped the marginal and central plates; but the remainder of the visceral surface would be in direct contact with the soft parts of the animal, and it is quite smooth or exhibits only lines of growth, except at the postero-external angle, where a feeble short ridge is directed forwards and inwards, evidently to strengthen the bony lamina at that point.

Though occurring on a detached fragment of matrix, the bone here interpreted as anterior median ventral (fig. 3) was found so closely associated with the occipitals already described, that Mr. Calder, who is an experienced collector, has no doubt as to its pertaining to the same individual. Its borders are completely preserved, thus proving that its obvious bilateral symmetry is not accidental; and the absence of facettes on the smooth visceral aspect, except possibly behind, indicates that it must have been overlapped by any lateral plates that were originally adjoining. The anterior border is nearly straight, and accompanied by a low, rounded, transverse ridge; and the anterior is the broader end of the bone, being produced on either side into a short and broad triangular extension. The thin hinder border is excavated by a symmetrical re-entering angle, into which the front margin of a diamond-shaped median ventral plate doubtless fitted.

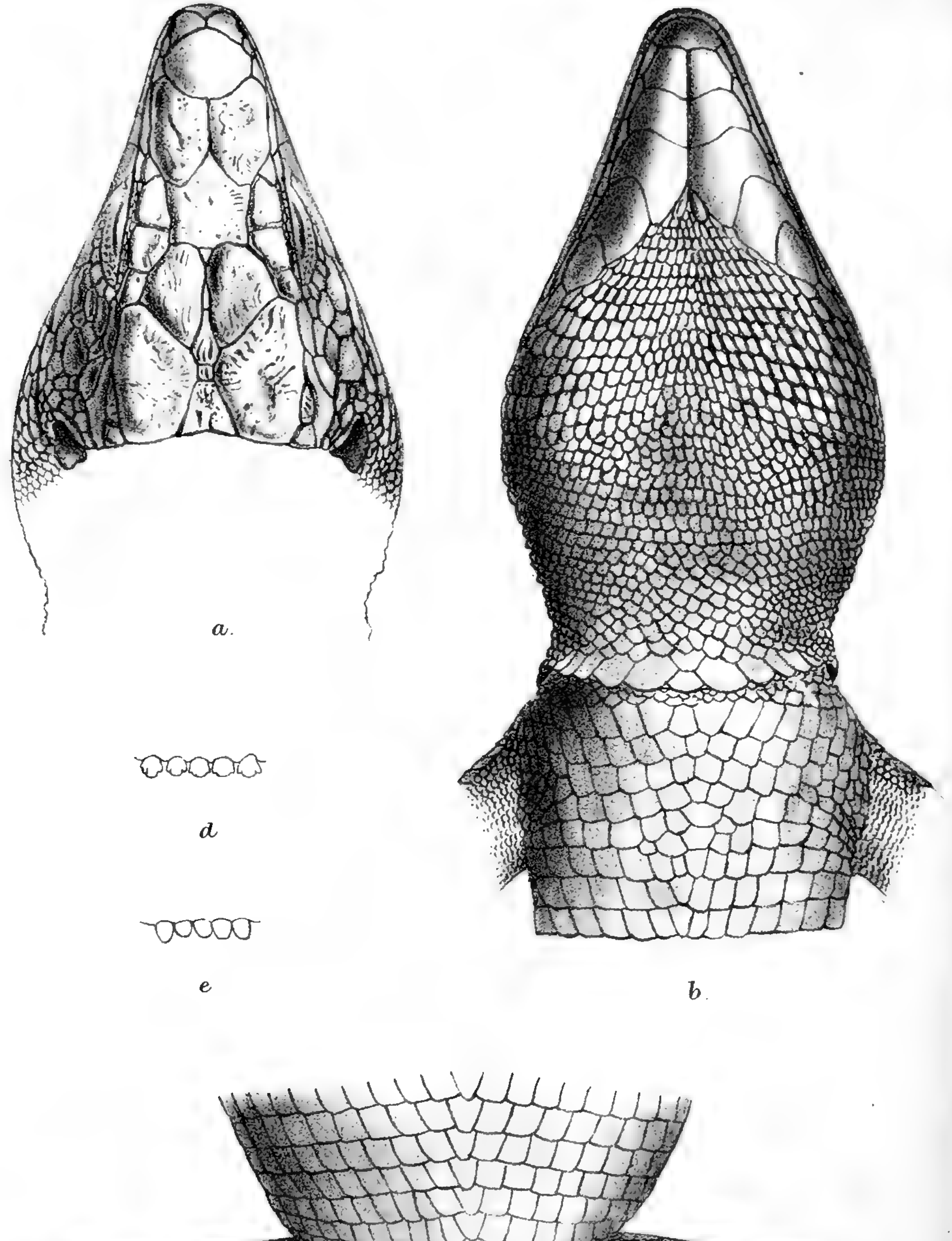
The fourth plate under consideration (fig. 4) also occurs upon a detached fragment of matrix, and is shown only as an impression of its visceral surface. The borders, however, are almost completely preserved; and the impression proves that the bone was not quite flat, but marked by two broad rounded folds extending and diverging from the shortest of the four margins. This margin is gently excavated, with a sharp angle at one end and a rounded corner at the other; while the only distinct evidence of an overlapping facette is at the opposite border, which seems to have been much attenuated. The state of preservation does not permit of ascertaining whether any other facettes were present; but the outline of the bone agrees so closely with that of the anterior ventro-lateral plates of *Coccosteus* that it is probable the two long borders joining those already noticed were also overlapping. Indeed, the element now described seems to differ only from the anterior ventro-lateral plates of *Coccosteus* in its



Peter Smit del. et lith.

Mintern Bros imp.

LACERTA SIMONYI.



Peter Smit del. et lith. Mintern Bros imp.

LACERTA SIMONYI.

comparatively short and broad proportions—the same feature by which the dorsal shield of *Homosteus* is most conspicuously distinguished from that of *Coccosteus*; and it may be added that if the originals of figs. 3 and 4 are correctly determined as anterior median ventral and ventro-lateral respectively, they represent a fish of exactly the same size as that indicated by the occipital plates with which they are associated.

In conclusion, the new evidence seems to show that the "cranial shield" of *Homosteus* extended backwards far beyond the hinder extremity of the brain; while there are suggestive indications of the ventral shield having been as remarkably short and broad as the dorsal. The last mentioned result is exactly such as might have been anticipated; but the former, if substantiated by further discoveries, presents some novel features for investigation.

2. On Simony's Lizard, *Lacerta simonyi*. By G. A. Boulenger, F.Z.S.

[Received March 3, 1891.]

(Plates XVIII. & XIX.)

The largest of the three specimens of *Lacerta simonyi*, Steindachner[1], obtained by Canon Tristram on the Rock of Zalmo, near Hierro, Canary Islands, and presented to the Society by Lord Lilford, having recently died, has been acquired by the British Museum. I propose to give a description and figure of this rare Lizard as a supplement to Dr. Steindachner's account. The specimen here described is a male.

Physiognomy and general proportions of *Lacerta ocellata*. Head large, with swollen cheeks; snout moderately long, obtuse. Rostral entering the nostril; a single postnasal, in contact with the first and second labials; frontal as broad as long, not quite as long as the frontoparietals; supraoculars separated from the supraciliaries by a series of granules; interparietal very narrow, as long as the occipital; occipital large, trapezoid, its posterior border two thirds the width of the frontal; five upper labials anterior to the subocular; temple covered with large irregular shields; a narrow elongate shield on the upper anterior border of the ear; the so-called masseteric shield more or less enlarged. Gular fold absent; 34 gular scales on a line between the collar and the third pair of chin-shields; collar with serrated edge, composed of 13 plates. Dorsal scales small, oval, strongly keeled, separated from one another by minute granules; 90 scales across the middle of the body; two or three series of scales on the sides correspond to one ventral plate. Ventral plates square in the middle, longer than broad on the sides, in 20 longitudinal and 34 transverse series. Præanal plate bordered by three semicircles of small plates. The hind limb reaches the axilla.

[1] Anz. Ak. Wien, 1889, p. 260.

Femoral pores 31—31. Tail nearly once and a half as long as head and body (reproduced); caudal scales strongly keeled, with truncate posterior border. Blackish brown above; a lateral series of six or seven roundish pale yellow spots, gradually decreasing in size from front to back, the first above the shoulder; three other large yellowish spots lower down on each side, extending on to the outer ventrals; lower parts brown, yellowish in the middle of the belly; some of the ventrals tinged with red.

	millim.
Total length	535
Head	57
Width of head	45
From end of snout to fore limb	90
From end of snout to vent	210
Fore limb	80
Hind limb	120
Tail (reproduced)	325

The teeth have tricuspid crowns, the lateral cusps being stronger and more regular than in any of the adult *Lacertæ* which I have examined. They differ much from those of a *Lacerta ocellata* of similar size in not being worn down, as may be seen from the figures (Plate XIX. figs. *d*, *e*) appended to this paper, which represent the lateral teeth in the two Lizards.

Lacerta simonyi has been correctly compared by Steindachner with *L. galloti* from the Canary Islands, which must be regarded as its nearest ally. Its affinities to *L. ocellata* are, however, equally striking, for though it agrees with the former in its single postnasal, its five anterior labials, and the number of femoral pores, it differs from it and agrees with the latter in its temporal scutellation and its denticulate collar. It appears to me, therefore, that *L. ocellata* and *L. galloti* are more intimately connected than has been hitherto believed.

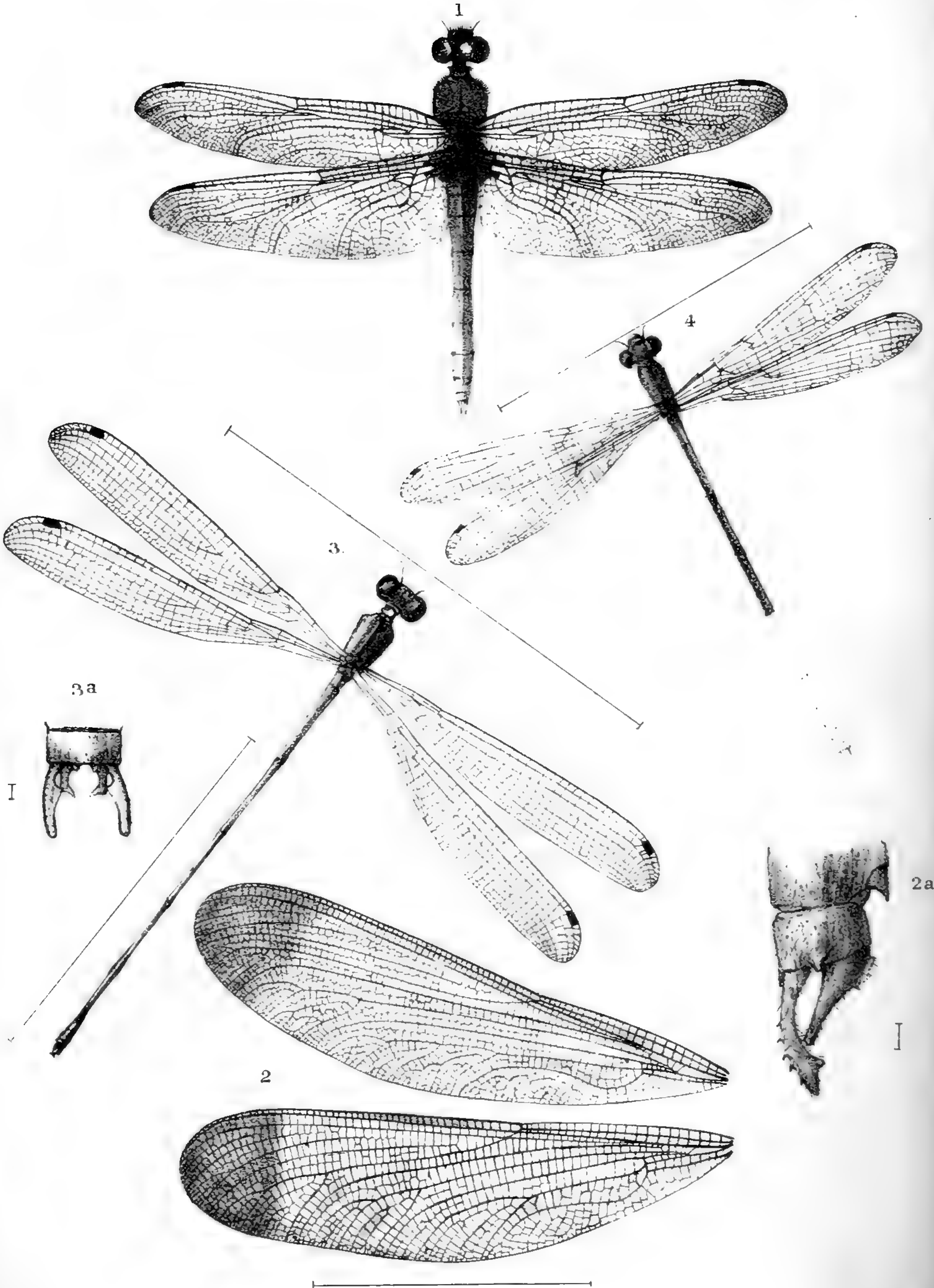
EXPLANATION OF THE PLATES.

Plate XVIII.

Lacerta simonyi, ♂. Two thirds natural size.

Plate XIX.

a. Upper view of head of *Lacerta simonyi*.
b. Lower view of head of ditto.
c. Anal region of ditto.
d. Maxillary teeth of ditto. Multiplied two diameters.
e. Maxillary teeth of *Lacerta ocellata*. Multiplied two diameters.



F. H. Michael del. et lith.

Mintern Bros imp.

NEW DRAGONFLIES FROM CEYLON.

3. On some Neuroptera Odonata (Dragonflies) collected by Mr. E. E. Green in Ceylon. By W. F. Kirby, F.L.S., F.E.S., Assistant in Zoological Department, British Museum (Natural History), S. Kensington.

[Received March 17, 1891.]

(Plate XX.)

Among the insects from Ceylon which Mr. E. E. Green has lately presented to the British Museum are a few Dragonflies, representing 16 species, 3 of which appear to be new, while one or two of the others have not previously been recorded from the island. As they are nearly all carefully marked with dates and localities, I think it will be useful to enumerate them, though the small number of species represented renders it impossible to attempt any generalizations.

Libellulidæ.

Libellulinæ.

Rhyothemis, Hag.

1. Rhyothemis marcia.

Libellula marcia, Drury, Ill. Ex. Ent. ii. pl. xlv. f. 3 (1773).

A common East-Indian species.

Trithemis, Brauer.

2. Trithemis trivialis.

Libellula trivialis, Ramb. Ins. Névr. p. 115 (1842).

Kandy (Aug. 1888).

Occurs in India and Ceylon.

3. Trithemis yerburii.

Trithemis yerburii, Kirb. Cat. Neur. Odon. p. 18. n. 5 (1890).

Pundaloya (April 1889).

In the British Museum from India, Ceylon, and Borneo.

De Selys considers this species to be the true *T. aurora*, Burm.

Orthetrum, Newm.

4. Orthetrum pruinosum.

Libellula pruinosa, Burm. Handb. Ent. ii. p. 858. n. 63 (1839).

Pundaloya (Sept. and Oct. 1888).

A common species in the East Indies.

A specimen taken in January 1889 may be a variety of the female of this species, or may belong to *O. carnaticum*; it is tawny yellow, with two broad reddish-brown stripes on the sides of the thorax, the uppermost intersected by a black line close to its upper edge.

5. Orthetrum carnaticum. (Plate XX. fig. 1.)

Libellula carnatica, Fabr. Ent. Syst. Suppl. p. 284 (1798).

Pundaloya, Ceylon (Feb. 1889).

Not previously known from Ceylon; the British Museum has specimens from Nepal.

The insect, which I identify with the Fabrician species, is closely allied to *O. triangularis,* Selys; but De Selys refers Fabricius's description to *Trithemis cæsia,* Ramb.

Agrionidæ.

Agrioninæ.

Neurobasis, Selys.

6. Neurobasis apicalis, sp. n. (Plate XX. figs. 2, 2 *a*.)

Exp. nearly 3 inches.

Male. Bright green above; head with a short black streak in front of the ocelli; antennæ black, conspicuously testaceous beneath; labrum black, with the rim and a large spot on each side testaceous; labium testaceous, lined with black. Thorax with the sutures black in front and testaceous behind; under surface testaceous. Legs black. Wings iridescent-hyaline, front wings shining with magenta, and hind wings with coppery-green in the sunlight; tips of all the wings dusky. Upper anal appendages hairy, with a triangular tooth on the lower surface and 5 teeth on the upper.

Nawala-pittia, Ceylon.

It is to be regretted that Mr. Green only obtained one damaged specimen of this handsome species, which resembles an *Echo* in its markings, though its neuration clearly shows it to be a *Neurobasis.*

Pseudophæa, Kirb.

7. Pseudophæa splendens.

Euphæa splendens, Selys, Syn. Cal. p. 52 (1853).

Pundaloya (Sept. 1888).

Mr. Green obtained both sexes; the female is rarer in collections than the male.

Micromerus, Bamb.

8. Micromerus finalis.

Micromerus finalis, Selys, Bull. Acad. Belg. (2) xxvii. p. 665 (1869).

Nawala-pittia (Oct. 1889).

Originally described from Ceylon.

Cœnagrioninæ.

Platysticta, Selys.

9. Platysticta greeni, sp. n. (Plate XX. fig. 3, 3 *a*.)

Long. corp. 48 millim; exp. al. 62 millim.

Male. Pterostigma brown, the lower edge twice as long as the breadth, covering one or two cells; some of the apical cells beyond divided; nodal sector broken through the greater part of its length, rising from the vein descending from the nodus; subnodal entire, rising separately a little before the other; 21–26 postcubital nervures; sectors of the arculus rising from a short stalk; sometimes two basal postcostal nervures close together instead of one, in one or other of the wings.

Head bronzy black; rhinarium, labrum, and base of mandibles white. Prothorax bronzy black above, shading into bronzy green at the extremity; under surface testaceous, with an oblique white or very pale green stripe on the sides; the extremity beneath and on the lower border of the same colour. Legs, except the tibiæ and tarsi, which are black, some spots between the wings above, and the base and under surface of the abdomen rufous; the greater part of the three terminal segments of the abdomen with a pale mark above, which is probably blue during life. Upper appendages more than twice as long as the 10th segment, obtuse, and crossing inwards and downwards, with a strong tooth on the inner side near the base. Lower appendages about half as long, slender, the tips turned inwards at a right angle.

Belongs to the group of *P. hilaris*, Selys, but is apparently more like *P. maculata*, Selys, in general appearance, to judge from the description of that species.

Pundaloya (Aug. 1889).

Disparoneura, Selys.

10. Disparoneura cæsia.

Alloneura cæsia, Selys, Bull. Acad. Belg. (2) x. p. 460 (1860).

Pundaloya (Aug. 1889).

Micronympha, Kirb.

11. Micronympha aurora.

Agrion (*Ischnura*) *aurora*, Brauer, Verh. zool.-bot. Ges. Wien, xv. p. 510 (1865).

Taken at Pundaloya.

A widely-distributed East-Indian and Australian species.

Archibasis, Kirb.

12. Archibasis ceylonica, sp. n. (Plate XX. fig. 4.)

Exp. al. 50 millim.

Head rufo-testaceous, paler beneath. Thorax tawny above, inclining to greenish on the sides; beneath pale testaceous, as well as the legs; the short spines, and a stripe on the femora above, black. Abdomen with the first two segments, the sides and under surface dull greenish brown; second segment with a bronzy black stripe on the median line, expanded at the lower extremity, where there is a groove in the middle, but not quite reaching the end of the segment, which is marked with a narrow black transverse stripe.

A bronzy black stripe, showing slightly greenish in some lights, covers segments 3–6 above (terminal segments wanting). Wings hyaline, with 11 postcubital nervures; pterostigma pale yellow, very oblique and pointed at the ends, and covering less than one cell.

Kandy (August 1888).

Allied to *Stenobasis occipitalis*, Selys, from New Guinea; but in *A. ceylonica* the head is concolorous, and consequently there are no postocular spots, a character which I regard as purely artificial. *Archibasis* (*Stenobasis*, Selys) appears to differ from *Teinobasis* (*Telebasis*, p., Selys) in the position of the basal postcostal nervure. In *Archibasis* it is placed about halfway between the level of the two antecubital nervures, whereas in *Teinobasis* it is placed close to the level of the second.

13. Lestes elatus.

Lestes elata, Selys, Bull. Acad. Belg. xiii. p. 319 (1862).

Pundaloya.

14. Lestes gracilis (?).

Lestes gracilis, Selys, Bull. Acad. Belg. xxiii. p. 327 (1862).

A pair of *Lestes* in Mr. Green's collection from Pundaloya agree fairly well with De Selys's description of this species, but they present no trace of bluish colouring, and the male has only 9 postcubital nervures on the anterior wings; the female has 12. The genus *Lestes* is well represented in Ceylon; and I do not feel justified in describing Mr. Green's specimens as new in the absence of others of the same section from the island.

I have passed over two other Dragonflies in Mr. Green's collection, allied to *Agrionoptera* and *Cœnagrion* respectively, pending the acquisition of a larger series.

EXPLANATION OF PLATE XX.

Fig. 1. *Orthetrum carnaticum*, Fabr., p. 204.
2. *Neurobasis apicalis*, sp. n., neuration, p. 204.
2 *a*. —— ——, anal appendages.
3. *Platysticta greeni*, sp. n., p. 204.
3 *a*. —— ——, anal appendages.
4. *Archibasis ceylonica*, sp. n., p. 205.

4. On some Antelopes collected in Somali-land by Mr. T. W. H. Clarke. By Oldfield Thomas.

[Received March 17, 1891.]

(Plates XXI. & XXII.)

By the kindness of Messrs. Rowland Ward & Co., the well-known taxidermists of Piccadilly, I have been entrusted with the examination of the fine series of Antelope heads and horns recently collected in Somali-land by Mr. T. W. H. Clarke. These Antelopes prove to

1/3

J. Smit del. et lith.

Mintern Bros. imp.

AMMODORCAS CLARKEI.

½

J. Smit del. et lith

Mintern Bros. imp.

SKULL OF AMMODORCAS CLARKEI

be of so much interest zoologically, one of them representing not only a new species, and that a most beautiful one, but even a new genus, that I have thought it well to go through the whole collection, to record the length of the horns in all the specimens, such records of their local development being often very useful, and to make such notes upon them as appeared necessary.

The species represented in the collection are 8 in number, and, with the exception of the new one, *Ammodorcas clarkei*, have all been obtained in Somali-land before, although they have not in all cases been recorded.

Besides the Antelopes, Mr. Clarke obtained in Somali-land a skin of *Proteles cristatus*, Sparrm., a species, so far as I am aware, not hitherto recorded north of Angola.

1. Oryx beisa, Rüpp.

♂. L.[1] 781 millim. C.[2] 158.

2. Lithocranius[3] walleri, Brooke.

♂. L. 336. C. 140. Rings 27.
♂. L. 311. C. 133. Rings —.
♂. L. 313. C. 130. Rings 31.

As usual with Somali collections, several Gerenook Gazelles were obtained. This remarkable species has been made the type of a distinct genus by Dr. Kohl, and I believe rightly, for not only has it a very different skull from that of *Gazella*, but its external form and its habits are both quite unlike those of any member of the genus.

3. Ammodorcas clarkei[4], g. et sp. n. (Plates XXI. & XXII.)

a. L.[5] (round curve posteriorly) 286; do. anteriorly 279; base to tip in a straight line 222. C. 120; tip to tip 114. Rings 10.
b. L. (round curve posteriorly) 267; do. anteriorly 254; base to tip in a straight line 222. C. 114; tip to tip 89. Rings 8.
c. L. (round curve posteriorly) 245; do. anteriorly 245; base to tip in a straight line 221. C. 112; tip to tip 134. Rings 7.

This most remarkable animal combines the horns of a Reed-buck (*Cervicapra*) with the essential characters of a Gazelle, showing a special relationship to that most aberrant Gazelle the Gerenook (*Lithocranius walleri*), and appears certainly to be worthy of generic distinction. On the first arrival of the specimens, before the skulls were cleaned, and before Mr. Sclater had received from Mr. Swayne the face-skins mentioned below, the animal was naturally supposed to be a Reed-buck from the character of its horns, little likely as it

[1] Length round curves anteriorly. [2] Circumference at base.
[3] "*Litocranius*," Kohl, Ann. Mus. Wien, i. p. 82 (1886).
[4] Preliminary description of the species given, under the erroneous generic name of *Cervicapra*, Ann. Mag. N. H. (6) vii. p. 304 (March 1891). See also Mr. Sclater's remarks, above, p. 197.
[5] For the benefit of sportsmen and others not having metric measures available, it may be noted that the five measurements of the horns of *a*, in English inches, are $11\frac{1}{4}$, 11·0, $8\frac{3}{4}$, $4\frac{3}{4}$, and $4\frac{1}{2}$ respectively.

appeared that a Reed-buck would occur in the dry sandy plateau of Somali-land. Now, however, that better material is available, I am able to draw up a fairly complete account of the more essential characters of this most beautiful Gazelle, of the discovery of which Mr. Clarke, both as sportsman and naturalist, has so much reason to be proud.

Muzzle, character of face-markings, and presence of anteorbital glands as in *Gazella*. General form (as described by Mr. Clarke, see below) and skull more as in *Lithocranius*. Horns in curve and general appearance as in *Cervicapra*.

Coloration of face, using Sir Victor Brooke's phraseology[1], as follows:—Central facial band deep rich chestnut-rufous, becoming duller towards the bases of the horns; light facial streaks pure white, very prominent and sharply defined, extending the whole length of the head from the bases of the ears to the corners of the nostrils, somewhat duller and more indistinct at their extremities, but broadening in the middle to encircle the eyes; dark facial streak present but not strongly marked. Cheeks and sides of neck pale fawn; throat white. Crown between and behind horns brown or grizzled fawn, the latter condition occurring in the older of Mr. Swayne's two head-skins; a marked whorl of hairs situated between the ears. Back of ears short-haired, dark fawn basally, gradually darkening to black terminally; insides white-haired, but with black tips.

Horns evenly curved upwards and forwards, the basal halves running backwards and the terminal halves nearly vertically upwards, the main curvature being therefore exactly in the opposite direction to that found in *Gazella* and *Lithocranius*. The horns themselves slender, their smooth unridged portion very long, the first indistinct ridge occurring about 5 inches from the tip. Ridges widely separate, strongly defined anteriorly, but becoming abruptly obsolete about halfway round, the sides and back showing scarcely a trace of them; their number amounting to 10 in the oldest specimen available, a number probably but seldom much exceeded, judging by *b* and *c*, which, although fully adult, have only 8 and 7 ridges respectively. Of Mr. Swayne's two specimens one has 8 and the other 5 ridges.

Skull diverging from that of *Gazella* and approaching that of *Lithocranius* by being unusually low, long in the occipital region, with a comparatively straight cranio-facial angle, with very small bullæ, with the postero-internal wall of the suborbital fossæ imperfect, and with a remarkably small and slender lower jaw. On the other hand, it differs from the same skull by being peculiar to a less extent in all these points, by the greater development of the premaxillæ posteriorly, where they have a broad articulation with the nasals, by the larger nasals and smaller interparietal, and by the larger and more powerful teeth, which are absolutely larger in the smaller animal.

In its skull-characters, therefore, *Ammodorcas* stands just intermediate between *Gazella* and *Lithocranius*; in its muzzle and in the

[1] P. Z. S. 1873, p. 536.

characters of its markings it agrees fairly with both, but in general form with the latter only, that animal, like it, being peculiar for its extraordinarily long neck; and, finally, in the curvature of its horns it differs absolutely from both, as also from any of the other Gazelline genera, while it agrees with a group so different from it in all essential respects that the resemblance must evidently be an accidental one and not indicative of any relationship. Presumably the whole of the horn of this species is homologous with the terminal three or four inches of the Gerenook's horns; that is to say, with the upwardly curved part, the greater part of the horn having become obsolete while the upwardly curved tips have attained to a remarkable proportionate development.

The following are the dimensions of the skull of specimen *c*:—

Length, occiput to gnathion, 210 millim., tip of nasals to occiput 176, greatest breadth 95; height, crown to angle of lower jaw 94; nasals, length 67, breadth 26; interparietal, length 24, breadth 39; height of orbital opening 35, gnathion to front of anterior premolar 63; length of molar series 53. Lower jaw, condyle to front of symphysis 153; height from coronoid process to angle 70; height of ramus at centre of $\overline{\mathrm{m}^2}$ 15·4, at posterior end of symphysis 9.

In a letter addressed by Mr. Clarke to Mr. Rowland Ward, the following notes on the appearance and habits of this species are given: "The Somali name for these Antelopes is 'Debo Tag.' I shot them in the new country I went into, and did not see them in any other part. They have a very long thin tail, and, when they run, throw it up and over towards the neck. The neck is very long and thrown back towards the tail, so that the two look as if they would touch each other."

Shortly after the arrival of Mr. Clarke's specimens, Mr. Sclater received from Mr. Swayne two scalps of this species which he had bought in Berbera, and these scalps Mr. Sclater has most kindly handed over to me for the purposes of the present paper. Fortunately the muzzle of one of them has been preserved, so that I have been able to make out its strictly Gazelline character, and the description of the colours above given has also been taken from these specimens.

It is much to be hoped that more specimens of this beautiful Gazelle will soon be obtained, and that we may thereby gain a full knowledge of its range, habits, and natural affinities[1].

[1] P.S. (May 14th).—Mr. Clarke has favoured me with the following notes on this new Gazelle:—

"I saw this Gazelle for the first time on December 17th, 1890, about three hours from 'Bairwell,' or about one day from 'Buroa Well, Habergerhagi's country,' and afterwards on the road all the way into the Marehan district, 8° N. 47° E. I killed a male, and found one of the horns broken off close to the skull, which had apparently been done a year or so ago.

"They are very graceful animals, with a long neck and well-proportioned head and horns; the body is rather slender, but considerably larger than in *Gazella spekii*, about the size of a female *G. walleri*. The legs are long and slender; the hoofs are not so triangular as those of *G. spekii*, and small for the size of the animal.

Mr. Clarke informs me that the female of *Ammodorcas* is without horns, a character which allies it still more closely with *Lithocranius*, and removes it from the typical Gazelles. The exact locality at which he obtained the specimens is about a day and a half from the Buroa Wells, Central Somali, about 100 miles south of Berbera.

4. GAZELLA SŒMMERRINGI, Cr.

♂. L. 449. C. 133. Rings 22.
♂. L. 450. C. 127. Rings 22.
♂. L. 425. C. 130. Rings 21.
♀. L. 406. C. 75.

As noted by Mr. Lort Phillips [1], the Sœmmerring's Gazelles of Somali are larger and have longer horns than those found in Abyssinia. Mr. Clarke's female horns are especially noteworthy for their length and slenderness.

5. GAZELLA SPEKEI, Blyth.

Gazella spekei, Blyth, J. A. S. B. xxiv. p. 296 (1856) (description); id. Cat. Mamm. Mus. As. Soc. p. 172 (1863) (name given); Blanf. Zool. Abyss. p. 261, pl. i. fig. 5 (1870); Kohl, Ann. Mus. Wien, i. p. 77, pls. iii., iv. (animal, skull, and horns) (1886).

Gazella, sp. (Flabby-nosed Gazelle), Lort Phillips, P. Z. S. 1885, p. 932.

Gazella naso, Sclat. P. Z. S. 1886, p. 504, pl. li. (head).

♂. L. 292. C. 107. Rings 21.

"They have small ears and a long upper lip, just like those of *G. walleri* or a Giraffe. The horns are of the shape of a sickle, and less than 12 inches in length, the longest, out of the 11 males killed, measuring 11 inches. The tail, from what I remember, is about 12 or 13 inches in length, very thin, and thinly covered with black hair about one inch long.

"The colour of the body is like that of the neck, of a kind of pink fawn, but the belly is whitish and the tail black.

"The face resembles that of *G. walleri*, only *G. walleri* has no white from the eye.

"When running, or rather jumping, they look very peculiar; their long neck and head thrown back and the tail thrown forward, and there appears to be only a foot between head and tail.

"The country they are mostly found in is of low thorn-bush and sandy; they do not seem to like the big bushes, though at times they are found there. In this respect they differ from *G. walleri*, this species liking many bushes to go and rest in.

"The new Gazelle is to be found one day's journey from Buroa Wells, at an elevation of 3100 feet, to the Marchan country (800 feet), general course about S. by E., and is more numerous than any other kind of game, excepting *G. sœmmerringi*; but these are found only in the open country.

"Several times I saw the new Gazelle and *G. walleri* feeding together, but I never saw more than eight in a bunch, and on this occasion there was a male *G. sœmmerringi* with them.

"They have great vitality; this I put down to the large quantity of blood they have.

"The female resembles the male, but is without horns.

"Somali name 'Debo Tag,' which means 'carries tail high.'"

[1] P. Z. S. 1885, p. 932.

♂. L. 273. C. 102. Rings 19.
♂. L. 272. C. 98. Rings 17.
♀. L. 241. C. 70.

Mr. Clarke's specimens prove the fact, unsuspected or forgotten since 1856, that the original *G. spekei* of Blyth is the Flabby-nosed Gazelle of the Somali plateau, and not the smooth-nosed one of the lowlands near Berbera, to which the name has been applied by Mr. Lort Phillips. The smooth-nosed one is that described by Dr. Kohl as *G. pelzelni* (*loc. infrà cit.*), the horns of the latter brought by Mr. Clarke agreeing absolutely with one of the specimens of "*G. spekei*" obtained by Mr. Lort Phillips.

Without entering into details, the identity of "*G. naso*" with *G. spekei* is readily shown by the following extract from Lieut. (afterwards Sir Richard) Burton's notes on *G. spekei* given in Blyth's description:—"as you may observe that there is an elevation of loose replicated skin upon the nose."

The mistake has arisen not unnaturally by supposing that at Berbera Speke got the Berbera Gazelle (*G. pelzelni*), and there is little in Blyth's own description and nothing in Mr. Blanford's figures to have aroused a suspicion of the true state of the case.

The horns of *G. spekei* are readily distinguishable from those of *G. pelzelni* by their much greater curvature, those of the latter species being almost as straight as those of *G. thomsoni*, Günth., to which in fact *G. pelzelni* is most nearly allied. The black nose-patch of *G. spekei* affords also a ready mark of distinction from *G. pelzelni*, in which the upper surface of the muzzle is quite uniformly coloured.

Mr. Clarke says:—"The Gazelle heads were all shot beyond Ragar and have the big nose. The straight-horned one [*G. pelzelni*] is the common one round Berbera, but when once you get on the plateau, the big-nosed ones take their place. The two species are very much alike in the body, but the horns of the Berbera one are straight and it has no loose nose."

6. Gazella pelzelni, Kohl.

Gazella spekei, Lort Phillips, P. Z. S. 1885, p. 931 (*nec* Blyth).
G. pelzelni, Kohl, Ann. Mus. Wien, i. p. 76, pls. iii. & iv. (animal, skull, and horns) (1886).

a. ♂. L. 267. C. 95. Rings 17.
b. ♂. L. 297. C. 86. Rings 19.

Specimen *b* has nearly an inch of rough but un-ringed horn at the base below the large rings, showing that 19 rings are about as many as this species ever develops.

7. Oreotragus saltator, Bodd.

♂. L. 95.

8. Neotragus saltianus, De Blainv.

♂. Horns, l. 70.

All the North Somali *Neotragi* seem to belong to this, the Abyssinian species, and not to *N. kirki*, Günth., the East-African form, which, however, Mr. Lort Phillips obtained in Central Somali-land [1]. The same gentleman, and also Herr Menges, collected several specimens of *N. saltianus* in the neighbourhood of Berbera, and these are now in the British Museum. It may be noted, for the benefit of sportsmen, that besides the decided dental and osteological distinction described by Dr. Günther [2], the horns of *N. saltianus* may be distinguished from those of *N. kirki* by being flattened along their inner side and therefore triangular in section, while those of the latter species are rounded and therefore circular in section.

April 7, 1891.

F. Du Cane Godman, Esq., F.R.S., Vice-President, in the Chair.

The Secretary read the following report on the additions to the Society's Menagerie during the month of March 1891:—

The total number of registered additions to the Society's Menagerie during the month of March was 83, of which 35 were by presentation, 3 by birth, 39 by purchase, and 6 on deposit. The total number of departures during the same period, by death and removals, was 96.

Amongst the additions I may invite special attention to the following:—

1. A young example of the Ounce or Snow-Leopard (*Felis uncia*), purchased of Mr. W. Jamrach, March 6th, and believed to have been obtained in Bhotan. I have already (see above, p. 197) spoken of the acquisition of this most interesting animal, an example of the only species of the larger Cats which we have not previously been able to exhibit in the Gardens.

2. A small-clawed Otter (*Lutra leptonyx*) from India, acquired by purchase March 16th, being the second specimen of this Otter which has been obtained by the Society [3].

3. A Lhuys' Impeyan Pheasant (*Lophophorus lhuysi*), male. A fine example of this rare Pheasant from Szechuen, Western China, obtained by Mr. A. G. Pratt during his recent visit to that country, and purchased of him on the 18th March. This is the first example of the species received in Europe.

I may also remark that among the deaths registered in the Society's Gardens during the month of March was that of a European Crane (*Grus cinerea*), which was acquired by purchase on the 13th May 1848, and had thus lived nearly forty-three years in captivity.

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[1] *Cf.* Phillips, P. Z. S. 1885, p. 932, and Sclater, P. Z. S. 1886, p. 504.
[2] P. Z. S. 1880, p. 17.
[3] *Cf.* P. Z. S. 1888, p. 564.

The Secretary called attention to the breeding of the beautiful Antelope *Tragelaphus gratus* in the Gardens of the Zoological Society Natura Artis Magistra of Amsterdam (*cf.* P. Z. S. 1889, p. 220), and exhibited a water-colour drawing of the female and young two days old of this species, forwarded to him by Dr. C. Kerbert, the Director. The following extract from Dr. Kerbert's letter on this subject was read:—"Enclosed I have the pleasure to forward to you the coloured drawing of the female *Tragelaphus gratus* with young two days old, and I beg to add a few particulars about them. The male was received very young about 5 years ago, two females two years later, and the third was purchased last year, all of them from the West Coast of Africa. The first female was covered the 16th March, 1890, and the young born the 11th November; the second female was covered the 1st August, and within a short time we expect another young one.

"The young is growing very rapidly, and is at this moment 60 cm. high."

The Secretary exhibited on behalf of Mr. W. L. Sclater, F.Z.S., a specimen of a Duck apparently a hybrid between the Mallard (*Anas boscas*) and the Gadwall (*A. strepera*), and read the following extracts from a communication received from Mr. W. L. Sclater on this subject:—

"A specimen of a very curious Duck was brought to the Museum the other day; it was brought here alive, and there can be no doubt that it was obtained somewhere in the vicinity of Calcutta.

"I puzzled over it for some time, but was quite unable to identify it with any of the Indian Ducks or others of which I could easily find figures.

"Mr. Fraser, of this Museum, has suggested that it may be a hybrid between the Mallard and the Gadwall, and I have now little doubt that he is correct in his surmise.

"The following is a description of the bird, which proved on dissection to be a male:—Forehead and crown dark reddish brown, sides of the head and nape bright green, the green extending round the neck so as to form a ring, which is edged with a very thin band of white posteriorly and ventrally; cheeks and chin lightish brown; fore part of the back and scapulars grey barred with brown, getting darker till on the rump is blackish green; no recurved feathers in the tail; tail ashy, slightly edged with grey; primaries ashy grey; secondaries almost black, but with the typical bottle-green speculum; greater secondary coverts grey, broadly tipped with black; median coverts slightly tipped with chestnut-red; beneath, fore part of the breast red with black spots, the colour and spots gradually fading posteriorly, where the plumage is white narrowly barred with black; under tail-coverts black; axillaries white. Beak black on the culmen throughout the whole length; on either side a broad yellow band from the lores to the tip; feet bright red, nails black.

"A perusal of the description given above will, I think, convince every one that the bird is intermediate in its coloration between a Mallard and a Gadwall.

"The head, the wing, and the lower parts are specially noticeable, and the only conclusion one can come to is that it is a hybrid. Complete evidence on the subject of naturally bred hybrids of course it is almost impossible to obtain, but I do not see how this bird can be explained in any other way."

Mr. E. T. Newton exhibited and made remarks on a small and abnormally shaped egg of the Common Fowl.

The following papers were read:—

1. On the Geographical Distribution of Slugs. By T. D. A. Cockerell, F.Z.S.

[Received March 12, 1891.]

The Slugs, or naked Land-Mollusca, are found in almost every inhabitable part of the globe, but the distribution of the several families and groups is much more restricted, presenting features of considerable interest. Salt water is fatal to Slugs, and it is evident that on land they are little fitted for extensive migrations, their tardy pace being proverbial. They frequent old logs and trunks of trees, and may very possibly be carried down rivers or even over short arms of the sea on floating timber; but, broadly speaking, their means of distribution may be said to be almost as small as those of any group of living organisms, not excepting the Mammalia and Amphibia. It follows, therefore, that their geographical distribution offers points of special value as bearing on questions relating to the former extent of land, and also, perhaps, to the climate of earlier times.

For various reasons, which need not be discussed in the present paper, it is practically certain that at least the great majority of Slugs have descended from testaceous forms. This is especially clear in the *Limacidæ*, where in *Parmacella* and other genera the young is much more enclosed in a shell than the adult; while the life-histories of many of the slug-like *Helicarioninæ* are suggestive of a series of the still existing adult forms.

It is also evident that the Slugs are of polygenetic origin, a fact which should prevent their being nearly all classed under a single family, as is still sometimes done. Of the six families of Slugs recognized in the present paper, five are more nearly allied to as many testaceous groups than to each other.

The classifications of various authors are exceeding diverse, and especially does there seem to be the widest divergence of opinion among good authorities as to what constitutes a family. Thus Ray Lankester [1] gives a family *Limacidæ*, which includes three families

[1] Art. Mollusca, reprinted from Encycl. Brit. 1891.

according to my classification, two of which are usually considered more nearly allied to two of the genera he places in *Helicidæ* than to each other. On the other hand, Simroth[1] uses the family term *Urocyclidæ* for a group which I here place only as a tribe of the subfamily *Helicarioninæ*.

In order to bring the classification of the groups into a condition of approximate uniformity, I have to propose a partly new arrangement, based on the structural characters of the animals, and especially the jaw and lingual membrane. In this arrangement, for the sake of clearness, I have included the testaceous families which are more related to families of Slugs than to each other (see p. 216).

SUCCINEIDÆ.—*Janellinæ*.

A very remarkable subfamily, confined to the Australian region. The genera differ in the degree of development of the curious sulciform grooves on the back. From an examination of some very interesting material in the British Museum, I am able to classify the generic groups more clearly than has been done before. The following genera may be recognized:—

ANEITEA, Gray, 1860.—This seems to be the most highly developed of the genera. The respiratory orifice is situated at the apex of a grooved triangle, the base of which forms part of the dorsal groove. The described species are seven in number:—

A. macdonaldi, Gray.—New Caledonia, and reputed also to occur in the New Hebrides.

A. hirudo (Fischer).—New Caledonia.

A. modesta (Cr. & Fisch.).—New Caledonia.

A. megalodontes (Q. & G.).—New South Wales. This is the *Limax megalodontes* of Quoy and Gaimard, from near Port Jackson. It may not belong here; the description is not very clear.

A. gräffei (Humbert).—Queensland and New South Wales. The British Museum has examples of this large species from Brisbane and Sydney (*Challenger Coll.*).

A. krefftii (Keferst.).—Australia. A specimen in the British Museum is from the head of the Murray River (*Sir G. Macleay*). This species is very close to the last, but *A. krefftii* is yellowish-white, while *A. gräffei* is grey and has the triangular "mantle" longer in proportion to its breadth.

A. schutei (Keferst.).—Australia.

Probably the number of species will be considerably reduced when they are better known. *Triboniophorus*, Humb., is a synonym of *A eitea*.

ANEITELLA, n. gen., type *A. virgata* (Smith, P.Z.S. 1884).—This genus, from the Admiralty Is., differs from *Aneitea* in having only one of the grooves which form the triangular so-called mantle in that genus, namely that running obliquely backwards to the respiratory orifice. The only known species is well described and figured by

[1] Nov. Act. Ac. Cæs. Leop.-Car., 1890.

	Slugs.	*Helicoid or Bulimoid Allies.*
A. Jaw with an accessory quadrate plate [1]	SUCCINEIDÆ.	SUCCINEIDÆ.
a. No external shell, no true mantle	Subf. *Janellinæ.*	
b. Shell rudimentary, mantle present	Subf. *Hyalimacinæ.*	
c. Shell more or less external and spiral	Subf. *Succineinæ.*	*Succineinæ*
B. Jaw with no accessory quadrate plate.		
1. Male and female genital orifices distinct	VAGINULIDÆ.	
a. With a jaw	Subf. *Veronicellinæ.*	
b. With no jaw	Subf. *Vaginulinæ.*	
2. Male and female genital orifices not distinct.		
i. Central, lateral, and marginal teeth more or less quadrate	ARIONIDÆ.	HELICIDÆ.
a. Jaw usually ribbed		
α. Mantle covering body; shell none	Subf. *Philomycinæ.*	
β. Mantle not covering body; shell internal, rudimentary, or none.	Subf. *Arioninæ.*	
γ. Shell more or less whorled, at least at apex	Subf. *Binneyinæ.*	
b. Jaw smooth; shell none	Subf. *Oopeltinæ.*	
ii. Central and lateral teeth more or less quadrate, marginals aculeate	LIMACIDÆ.	ZONITIDÆ.
a. Jaw ribbed		Subf. *Pristilominæ* [2].
b. Jaw smooth.		
α. Shell non-spiral, internal; no caudal mucus-pore	Subf. *Limacinæ.*	
β. Shell apically more or less whorled; no caudal mucus-pore	Subf. *Parmacellinæ.*	
γ. Shell more or less vitrinoid; no caudal mucus-pore	Subf. *Vitrininæ.*	*Vitrininæ.*
δ. Shell more or less whorled or rudimentary; mucus-pore well developed	Subf. *Helicarioninæ.*	*Helicarioninæ.*
iii. Teeth all narrow.		
a. Jaw none	TESTACELLIDÆ.	OLEACINIDÆ.
b. Jaw present	SELENITIDÆ.	SELENITIDÆ.
α. Jaw smooth	Subf. *Trigonochlaminæ.*	Subf. *Selenitinæ.*
β. Jaw ribbed	Subf. *Cystopeltinæ.*	

[1] It is to be understood that in this synopsis I give merely an indication of the main characters of each group, which are correlated with various other peculiarities not here mentioned.

[2] For *Pristiloma*, Ancey. Included here for comparison; no Slug of similar characters is yet known.

Mr. E. A. Smith as *Athoracophorus virgatus*, and the original specimens are in the British Museum.

ATHORACOPHORUS, Gould, 1852 (=*Janella*, Gray).—A New-Zealand genus, consisting of small species with a dorsal groove, but in the typical forms no triangular "mantle" like that of *Aneitea*.

A. bitentaculatus (Q. & G.).—New Zealand.

A. bitentaculatus forma *antipodarum* (Gray).—New Zealand. Gray's type is in the British Museum, as well as a specimen from Wellington (*Otago Univ. Museum*). The variety differs from the type in being without spots.

Subg. *Konophora*, Hutton.—This subgenus or section scarcely differs from *Athoracophorus*, but the dorsal groove, in a specimen in the British Museum, is not carried forward medially beyond the point where it branches, and the diverging branches converge below the tentacles and unite just above the mouth.

A. marmoreus (Hutton).—New Zealand, South Island.

A. marmoreus forma nov.: 22 millim. long (in alcohol). Whitish, with scattered pale brownish depressed-raised tubercles, foot with a fairly well-defined margin. Dunedin (*Otago University Museum*), in the British Museum. This form differs very much in colour from Hutton's description of the type.

Subg. *Pseudaneitea*, nov.—Small Slugs of New Zealand and the Auckland Is., resembling *Athoracophorus*, but showing a decided tendency towards the formation of a "mantle-area" like that of *Aneitea*. The *Janella papillata* of Hutton may be taken as the type.

A. papillatus (Hutton).—New Zealand, North Island and South Island; also Auckland Is. and Chatham Is. A specimen from Dunedin (*Otago University Museum*) is in the British Museum. This species is widely different from *A. bitentaculatus*, of which it was considered a variety. The "mantle-area" is quadrangular, and the edges of the foot are excavate-grooved. The dorsal groove persists somewhat on the face.

A. verrucosus, V. Mts. in Simroth. Auckland Is. Very nearly allied to the last. The "mantle-area" is triangular.

A. marmoratus, V. Mts. in Simroth. Auckland Is. This will probably form a distinct subgenus or section. The specific name is unfortunately chosen, as there is already a *marmoreus* of Hutton.

NEOJANELLA, n. g. The most simply developed of the family, lacking both the "mantle-area" and the dorsal groove,

Neojanella dubia, n. sp.—Length (in alcohol) 53 millim., breadth 11 millim. Sole not differentiated into parts, and only a very slight groove between the sole and back. No "mantle-area." Respiratory orifice situated on the back, slightly to the right of the median line. Tail rounded, flattened, no keel, no mucus-pore. Sole pale yellowish. Back pale yellowish, marbled all over with black or dark bluish grey. Respiratory orifice pale, on a pale patch, which is ringed with black. Head injured and shrivelled in the specimen described.

External genital orifice on a pale patch, below and slightly anterior to respiratory orifice. No regular dorsal grooves.

Genital orifice from head 13, from respiratory orifice 5, from sole $2\frac{1}{2}$ millim. Respiratory orifice from head 16, from genital orifice 5, from sole 7 millim.

Described from a specimen in the British Museum, from the south side of Cook's Straits, New Zealand (*Wellington Museum*).

Hyalimacinæ.

Contains the genus *Hyalimax*, H. & A. Ad., with one species in the Andaman Is., one in the Nicobar Is., one in Bourbon, two in Mauritius, and one only on the Asiatic mainland—*H. viridis* Theob., of Pegu.

Succineinæ.

The typical but testaceous genus *Succinea* is widely distributed in both hemispheres. A slug-like genus, *Omalonyx*, d'Orb, is found in Trinidad, British Guiana, Brazil, and La Plata, and reported also from Guadeloupe and Juan Fernandez. A specimen in the British Museum from Pernambuco (*H. N. Ridley*) may be *O. patera*, Döring; it is paler and less marked than *O. unguis*, Fér.

VAGINULIDÆ.—*Veronicellinæ.*

This subfamily consists of the genus *Veronicella*, Blainv. (*Vaginula*, Fér.), with very numerous species in tropical regions, and the monotypic genus or subgenus *Leonardia*, Tapp.-Can., which differs in the more posterior position of the female genital orifice. The genus *Veronicella* consists of about 133 species, distributed as shown on pp. 219–220. The correct numbers cannot be exactly ascertained, as it is probable that some of the species will prove synonymous with others, while others may have to be placed in distinct genera[1]. It is also probable that many species remain to be discovered. The numbers given for each country, added together, make more than the total of 133, owing to the fact that several species inhabit more than one country. As a rule, however, the species have not a wide distribution; very many are peculiar to islands. There are no species in the Palæarctic or Nearctic Regions, the occurrence of *V. floridana* in Florida being merely an indication of the West-Indian affinities of the fauna of that State; while the anomalous fact of a species (*V. schivelyæ*, Pilsbry) in Bermuda seems to find its explanation in the probable introduction of the Bermuda species

[1] For example, I have recently examined specimens in the British Museum from the Neotropical region which seem worthy of at least subgeneric distinction, namely a species from Rio Janeiro referred to *V. taunaysi*, Fér., and the true *Veronicella lævis*, Blainv., from Jamaica. Férussac's name *Vaginula* may be used for the former, and thus we get:—

(1) *Veronicella*, Blainv. Sole narrow, rounded and not projecting beyond mantle posteriorly. Female genital orifice post-median. (Type, *V. lævis*, Blainv.)

(2) *Vaginula*, Fér. Sole broader, projecting beyond mantle posteriorly. Female genital orifice antemedian. (Type, *V. taunaysi*, Fér.)

from Mexico. I have compared the description of *V. schivelyæ* with that of the Mexican *V. moreleti*, Crosse and Fischer, and they would certainly seem to be the same species, though the female genital orifice of *V. schivelyæ* is said to be more posteriorly situated than that of *V. moreleti*.

Distribution of Veronicella.

(1) *Neotropical Region.*

Uruguay....	1 species.	Buenos Ayres.	3 species.
Brazil......	16 ,,	Peru	1 ,,
Venezuela ..	4 ,,	Chile	6 ,,
Ecuador	11 ,,	Argentine ..	4 ,,
Guiana	2 ,,	Mexico	4 ,,
Bolivia	1 ,,	Nicaragua ..	1 ,,
Cuba	2 ,,	Florida	1 ,,
Haiti	2 ,,	Bermuda....	1 ,,
Jamaica	2 ,,	Porto Rico ..	2 ,,
Dominica ..	1 ,,	St. Vincent ..	1 ,,
Martinique ..	1 ,,	St. Thomas ..	2 ,,
Guadeloupe ..	1 ,,	Paraguay....	3 ,,
Trinidad	1 ,,		

V. olivacea, Stearns, is reported from California, but it does not appear to be native there. *V. marianita*, Cousin, lately described from Ecuador, is apparently identical with *V. solea*, d'Orb.

(2) *Ethiopian Region.*

Natal	1 species.	Madagascar ..	5 species [1].
Delagoa Bay .	1 ,,	Comoro Is. ..	3 ,,
Mozambique .	1 ,,	Mauritius ..	4 ,,
Zanzibar	1 ,,	Bourbon	1 ,,
Liberia	1 ,,	Rodriguez ..	1 ,,
Gold Coast ..	1 ,,	Seychelles ..	5 ,,
Princes I. ..	1 ,,		

(3) *Oriental Region.*

India	2 species.	Ceylon	4 species.
Burmah	1 ,,	Sumatra	4 ,,
Siam	2 ,,	Philippines ..	3 ,,
Cochin China.	2 ,,	Nias	1 ,,
Camboja	1 ,,	Borneo	4 ,,
China	8 ,,	Java	12 ,,
Malacca	2 ,,	Celebes	1 ,,
Saleyer Is. ..	1 ,,	Flores	1 ,,
Moluccas....	3 ,,	Amboina....	1 ,,

[1] In Madagascar we get a subgenus *Imerinia* (subg. nov.), which has the sole very narrow, not projecting posteriorly; mantle above and below thickly impressed-punctate, and above with scattered raised warts; ♀ orifice postmedian, not very near to sole; median dorsal line slightly impressed; anterior right edge of mantle sometimes tufted with red-brown bristles. This subgenus is founded on some specimens from Imerina in the British Museum, which will be described more fully elsewhere.

(4) *Australian Region.*

New Guinea ..	2 species.	Queensland ..	3 species.
New Caledonia .	1 ,,		

There are also specimens from Port Elizabeth, S. Africa, Panama, Honduras, and St. Lucia in the British Museum collection, of which I hope to write at some future time[1].

Vaginulinæ.

While the *Veronicellinæ* have a ribbed jaw and quadrate marginal teeth, the *Vaginulinæ* have no jaw and the teeth all aculeate. Thus the two subfamilies differ from one another much as the *Arionidæ* differ from the *Testacellidæ*, so far as these particulars are concerned, but in other respects they seem so closely allied that they may be united under a single family. It would be interesting to ascertain whether the *Vaginulidæ* are carnivorous, as from their structure they should be.

Under *Vaginulinæ* are three genera:—*Rathousia*, Heude, with three species, from China; *Vaginulus*, "Stol."[2], Cochin China and the Malay Peninsula; and *Atopos*, Simroth, found in Amboina and Mindanao, and apparently also in New Guinea and Queensland. Perhaps these three genera will not all prove distinct, but I have not made any critical examination of them myself. Superficially, the species of *Vaginulus* may be known by their subcylindrical shape and broad sole, *Veronicella* being flattish with a narrow sole. A species which I refer to *Vaginulus* is in the British Museum, from Penang; and an *Atopos* (or something closely allied) from Huon Gulf, New Guinea. This last is probably the *V. prismatica*, T.-Can., which is, I suppose, a species of *Atopos*[3].

ARIONIDÆ.—*Philomycinæ.*

Consists of a single genus *Limacella*, Blainv. (*Philomycus*, Raf.), which I have treated in some detail in Ann. Mag. N. H. for Nov. 1890. The distribution of *Limacella* is very remarkable. It occurs in Central America and Eastern North America, but not at all west of the Rockies. It reappears in the Chino-Malay and Indian regions, the only intermediate localities being Japan and the Sandwich Is.

[1] Dr. Simroth has just published a paper (see Bes. Abdr. nat. Ges. Leipzig) in which many new species are indicated; I have altered the statistics above so as to include these. For the anatomy of many species of this genus see Semper, Reisen im Arch. Phil. 1885.

[2] Stoliczka is quoted as authority for this genus as here limited, but he did not actually propose a genus *Vaginulus*; indeed he described (Journ. As. Soc. Bengal, 1873) a species from Penang with the characters of this genus under the head of *Veronicella birmanica*. *Vaginulus*, as here understood, was defined by W. G. Binney in 1879.

[3] Since this was written, I have received a letter from Dr. Simroth, to whom I had sent some particulars of the Penang and Huon Gulf specimens. He thinks that the Penang one (which is certainly a species of *Vaginulus* W. G. Binney) is congeneric with his *Atopos*, and that the Huon Gulf one (apparently *V. prismatica*, T.-Can.) probably represents a new genus or subgenus.

Arioninæ.

There are seven recognizable genera in this subfamily.

Arion, with numerous described species, is confined to the European region, except that species have been introduced by human agency into North America, New Zealand, and St. Helena. The St. Helena species is *A. hortensis*, Fér.; six specimens from this locality are in the British Museum, collected by Mr. A. E. Craven. The New Zealand species was described as a new species, *A. incommodus*, Hutton; but a specimen in the British Mnseum from Dunedin (*Otago Univ. Mus.*) shows it to be the *cinereo-fuscus* form of *A. subfuscus*, Drap. The genus *Arion* also occurs in Madeira and the Azores, where it has some appearance of being native, though none of the species are peculiar. There are two specimens of *A. subfuscus* from Madeira in the British Museum (*Mr. Mason*), and *A. empiricorum*, Fér., has been recorded from there. Among the Azores species there is, according to Simroth, a small insular variety of *A. lusitanicus*, Mab.

Ariunculus, Lessona, is a small genus of the Mediterranean region, with one species in Sardinia, and three in Piedmont. One of the latter is also found in the Dept. of Var, in S.E. France.

Geomalacus, Allman, with its subgenus *Letourneuxia*, Bgt., has nine supposed species, found in different parts of Portugal and Algeria, with one species at the Straits of Gibraltar and another in Co. Kerry, Ireland. The distribution of the Irish species, *G. maculosus*, is very interesting, as it seems to be confined to a small district in S.W. Ireland, and Portugal, though it has been reported also from N.W. France. It is also worthy of notice that in the more northern part of its range the genus shows a strong tendency to lose its bands and become dark with pale spots, while the southern species are very distinctly and invariably dark-banded.

Tetraspis, Hagenm., an extraordinary genus with a mantle-aperture, from Carniola, may safely, I think, be put on one side, because Hagenmüller's description and figure seem to belong merely to a specimen of *Arion* allied to *hortensis*, with an artificially-made hole in the mantle! The flexion of the mantle-bands does not prove the hole to be normal, as *A. alpinus*, which has no mantle-aperture, has them strongly curved outwards much as in *Tetraspis*. *Aspidoporus*, Fitz., 1833, from Austria, is another supposed genus with mantle-aperture, founded really on a species of *Amalia* [1].

The next genus of the subfamily is met with in the far-distant Himalayas, namely, *Anadenus*, Heynem. For an account of the species see Ann. Mag. Nat. Hist., Oct. 1890. There are six described species, some of them of great size. From the Himalayas eastward there are no other Asiatic representatives, the subfamily being, so far as is known, entirely absent in the Chinese, Malay, and Australian regions. It is also absent in South America, and in all parts of North America except the Pacific region, where it is largely developed, with three distinct genera. *Ariolimax*, Mörch, containing some

[1] See Heynemann, Jahrb. d. mal. Ges. 1884.

forms of considerable size, is found along the Pacific coast of the United States and in British Columbia, while a subspecies of *A. californicus* occurs even so far south as Costa Rica. *Prophysaon* has a somewhat similar distribution, but does not go into Central America; it has its strongest development in the State of Washington, and goes inland as far as Idaho.

Anadenulus, a monotypic genus allied to *Anadenus*, is confined to Southern California.

Binneyinæ.

This subfamily is proposed for certain slug-like genera, resembling the *Helicarioninæ* outwardly, but having the jaw and dentition of *Arioninæ*. *Binneya*, J. G. Coop. (=*Xanthonyx*, Cr. & F.), may be taken as the type. It is found in Mexico and on Santa Barbara Island, off the coast of California. Mr. W. G. Binney sent me a shell of *B. notabilis* from the latter locality. *Cryptostracon*, W. G. Binn., from Costa Rica, and *Hemphillia*, Bl. & Binn., from the N.W. United States, both monotypic genera, may also be conveniently referred here, and also *Peltella* from Brazil, with the allied or identical West-Indian genus *Gæotis*, Shuttl. Curiously, also, the genus *Otoconcha*, Hutton, from North Island, New Zealand, has all the characters of this subfamily, nor is this the only resemblance between the Mollusca of Western North America and New Zealand.

Oopeltinæ.

Contains only the genus *Oopelta*, Mörch, in Heynem., from the Guinea and Cape of Good Hope regions. I have never seen the type species, *O. nigropunctata*, but I refer the "*Arion*" *aterrimus*, Gray, contained in the British Museum, to this genus.

LIMACIDÆ.—*Limacinæ.*

(1) LIMAX, auctt.—This genus, as restricted by modern authors, is indigenous only in the Western Palæarctic or European region. It is true that many species of *Limax* have been described from distant regions, but in every case, so far as can be ascertained, they are either European species introduced (thus *L. flavus* received two synonyms in Australia) or they do not belong to *Limax* at all. The most typical form of *Limax* has its greatest development in Northern Italy, and consists of numerous species or subspecies allied to *L. maximus*, L., and *L. cinereoniger*, Wolf. Allied to these is *L. flavus*, L., which has become almost cosmopolitan through its introduction into various countries by human means. Thus, the British Museum contains examples of this species from Rarotonga and the New Hebrides (*Rev. Wyatt Gill*), St. Helena (*J. C. Melliss*), Sydney ('*Challenger*' *Coll.*), Savannah, United States (*W. G. Binney*), and I have received it from Washington, U.S.A. (*Dr. R. E. C. Stearns*), Lexington, Virginia (*Prof. J. H. Morrison*), and Burlington, New Jersey (*W. G. Binney*). Another subgroup (*Lehmannia*, Heyn.) has its type in *L. marginatus*, Müll., a species widely distributed in

Europe, frequenting beech-woods, and often found at considerable altitudes above the sea. In Ireland it has developed a remarkable spotted race, *maculatus*, Roebuck.

Limacopsis or *Frauenfeldia* is a group belonging to S.E. Europe, at present little known.

(2) MALACOLIMAX, Malm.—A genus with six species intermediate in some respects between *Limax* and *Agriolimax*, belonging to the Western Palæarctic region. Mr. Pollonera has sent me *M. nyctelius*, Bgt., from Algeria, and *M. valentianus*, Fér., from Barcelona.

Mesolimax, Poll., founded on *M. brauni*, Poll., from Asia Minor, is somewhat similar, but more allied to true *Limax*.

(3) AGRIOLIMAX, Mörch.—This genus, differently from *Limax*, is exceedingly widely distributed, having *apparently* indigenous species in the Palæarctic, Ethiopian, Australian, Nearctic, and Neotropical regions. It is found, however, that all the species outside of the Palæarctic region resolve themselves into either (1) *A. agrestis*, L., of Europe, introduced, or (2) allies of the European *A. lævis*, Müller. Dr. Simroth is of the opinion that these numerous *lævis*-allies are all referable to the true *A. lævis*; but I have examined a good many of them, and am confident that a few species of non-Palæarctic *Agriolimax* will have to be kept as valid. In North America I should regard *A. campestris*, Binn., as a species, with *montanus*, Ing., *hyperboreus*, Wst., and *occidentalis*, Coop., as slight races of it.

A. berendti, Strebel, of Central America, has a Californian race *hemphilli* (*Limax hemphilli*, W. G. Binn., 1890); this species resembles *L. agrestis* rather than *campestris* in its dentition. I shall have occasion to discuss the genus *Agriolimax* in detail at some future time, and so will not give further particulars here.

(4) AMALIA, Moq.—Consists of three sections:—*Subamalia*, Poll., with four reputed species from S.E. Europe; *Tandonia*, L. & P., with many species, all European, except one in Syria (concerning which see Ann. Mag. N. H., Oct. 1890); and *Pirainea*, L. & P., which is very well developed in the Mediterranean region, occurs throughout Western Europe and in the Atlantic Islands, and also at the Cape, in Brazil, in Juan Fernandez, in the Sandwich Islands, on the Pacific coast of North America, in New Caledonia, and in New Zealand, Australia, and Tasmania. It seems to be native outside of the European region in North America (the Pacific coast *only*) and in New Zealand and Australia; but its wide distribution elsewhere is no doubt largely due to accidental introduction by human means. Broadly speaking, *Pirainea* may be said to be cosmopolitan in *damp temperate* regions; but I will not here give the distribution in detail, as I shall treat the group fully on another occasion.

Prof. Ralph Tate in 1881 described two species of *Amalia* (as *Milax*) from the Australian region. *A. tasmanica*, from Tasmania, seems allied to the New-Zealand *A. antipodarum*, while *A. nigricola*, from Adelaide, South Australia, should be compared with *A. maura* (Q. & G.) from New South Wales. *A. nigricola* has been reported as *A. nigricollis* from Tasmania, but I believe erroneously.

The genus or subgenus *Gigantomilax,* Bttg., was founded on a large species from the Caucasus. *Lytopelte* and *Platytoxon* are names used for a West-Asiatic group with few species, seemingly intermediate between *Amalia* and *Agriolimax.*

(5) EUMILAX, Bttg. (*Paralimax,* Bttg.).—Consists of species from the region of the Caucasus and Armenia, with the external appearance of *Amalia* and the dentition of *Agriolimax,* but differing obviously from both these genera in the anterior position of the respiratory orifice. I have examined specimens of *Paralimax intermittens,* Bttg., and *Eumilax brandti,* V. Mts., in the British Museum, and they seem to belong to the same genus. *Eumilax,* being the prior name, must be used.

Parmacellinæ.

This subfamily contains only the genus *Parmacella,* Cuv., which is, perhaps, the most highly specialized of all the Slugs. There are 8 supposed species, found in Western Asia, Egypt, Algeria, Morocco, Spain, Portugal, and the Canary Is.

A subspecies of *P. valenciennii,* which I described as var. *maculata,* is found, together with its form *olivacea,* on both sides of the Straits of Gibraltar. It is interesting that the forms of *P. valenciennii* found at Gibraltar and Tangier should be identical; further north, in Portugal and France, the species gradually loses the dark markings on the mantle and becomes spotless.

Vitrininæ.

Vitrina, Drp., is a testaceous genus characteristic of the Palæarctic and Nearctic regions and the Atlantic Islands. Many species have been described from South Africa and other localities, but until the soft parts of all are known, it will not be possible to say how many may be really referable to *Helicarion.* Other slug-like genera referred to this subfamily are *Vitrinoidea, Vitrinopsis,* and *Vitrinoconus* of Semper, from the Philippines, and *Parmella,* H. Ad., from the Fiji Is.

Helicarioninæ.

I have given a table of the genera of this subfamily in Ann. Mag. Nat. Hist. for Jan. 1891. Their distribution is in many ways instructive. The *Urocyclus*-group is very characteristic of, and confined to, the Ethiopian region.

Estria and *Aspidelus,* from the Guinea region, are two monotypic genera which may prove identical, or at least only subgenerically distinct.

Vitrinozonites from the Eastern United States, and *Velifera* from Costa Rica, represent the subfamily in America.

Ibycus occurs in the Himalayas, in Siam, and in Java; it also exists in Borneo, if, as I believe, the *Parmarion baccarii* and *P. doriæ* of Issel (which are probably two forms of the same species) are correctly referable to it. *Girasia* is specially characteristic of the

Indian region[1]. *Mariaella*, a very distinct genus, has almost identical forms in S. India, Ceylon, and the Seychelles. *Parmacochlea* has a single species from the northern extremity of Queensland, but is represented in the Indian region by a subgenus *Pseudaustenia* (nov. nom.) of *Ibycus*, the type of which is the *Africarion ater* of Godwin-Austen. *Austenia* is a genus of the Indian region, with some very different species, which will probably form new subgenera.

Helicarion is very numerous in species, about 101 being known. The genus is quoted from Africa, the Indian, Chinese, and Malay regions, Australia, &c. It is very noteworthy, however, that it seems to be absent in New Zealand, the *H. dimidiatus* of that island being an *Otoconcha*. It is found, nevertheless, in the Auckland Is. (*H. zebra*, Le Guill.), Lord Howe's I. (*H. hilli*, Cox), and New Caledonia (*H. keppelli*, Pfr.). It is best developed in Australia (18 species) and the Philippines (17 species). When the animals are fully known, the genus will doubtless have to be subdivided. Such species as *H. cumingii*, Beck, and *H. bocki*, Smith, might be separated from *Helicarion* by their shells alone, at least subgenerically.

H. vitrinina and *H. ramsayi* of Liardet, from the Fiji Is., probably represent a single species showing colour-variation of the animal.

TESTACELLIDÆ.

Testacella and *Daudebardia* are genera belonging to the European, or, more precisely, Western Palæarctic, region, each with a fair number of species. These genera have also been reported from New Zealand, but probably the species referred to by Hutton (Trans. N. Z. Inst. 1883) belong to some other genus. *Chlamydephorus* is a distinct and peculiar genus from South Africa, with one species. *Selenochlamys*, Bttg., founded on a species from Transcaucasia, is allied to *Daudebardia*, but has no shell.

SELENITIDÆ.—*Trigonochlaminæ*.

A family allied to *Testacellidæ*, but possessing a jaw. The present subfamily includes *Trigonochlamys* and *Pseudomilax* from the Caucasian region, and *Plutonia* from the Azores, the latter monotypic[2].

Cystopeltinæ[3].

Contains only the remarkable genus *Cystopelta* of Tate, founded on a single species, *C. petterdi*, found in Tasmania.

[1] The group of *G. crocea*, G.-A., although true *Girasia*, shows a resemblance to *Mariaella* in some of its characters. The species which I described as *Girasia depressa* I now consider to be a variety or subspecies of *G. crocea*.

[2] A most important work by Dr. Simroth on the Portuguese, Azores, and other Slugs has just appeared (Nova Act. Acad. Cæs. Leop.-Car. 1891), containing a detailed account of *Plutonia*.

[3] Mr. Hedley has lately published a very interesting paper on *Cystopelta* in Proc. Linn. Soc. N. S. W. 1890, p. 44. It would seem that this subfamily is intermediate between *Selenitidæ* and *Helicarioninæ*.

This completes the subfamilies and recognizable genera of Slugs. I have in this paper preferred to give the facts almost without any discussion of the problems illustrated by them, partly because such a discussion would be more suitable in connexion with a paper of less limited scope, and partly because it would render the present contribution unduly long.

2. On a Viviparous Bathybial Fish from the Bay of Bengal. By A. Alcock, M.B., Surgeon I.M.S. (Communicated by Prof. J. Wood-Mason, F.Z.S.)

[Received March 16, 1891.]

In the 'Annals and Magazine of Natural History' for November 1889 (vol. iv. ser. 6, pp. 389–390), I described under the name of *Saccogaster maculata* a new type of Brotuline Ophidiids allied to *Catœlax*. The two specimens upon which the genus was established were described as females $3\frac{3}{8}$ and 4 inches long, with gravid ovaries; they were taken in 193 fathoms off the mouths of the Gangetic Delta.

Among the characters which distinguish *Saccogaster* the two most marked are its sac-like abdomen and its loose imperfectly-scaled skin.

On the 24th December last, in a very successful haul of the trawl in 240 fathoms off the mouths of the Kistna Delta, another specimen of *Saccogaster maculata* was obtained. It proved to be an adult male, $3\frac{1}{2}$ inches long, with ripe milt. Though otherwise resembling the female in external characters, it differs in having a deep post-anal depression or excavation, which is filled by a large bilobed papilla with the genital pore opening into the groove between the lobes. The papilla is thick, fleshy, and smooth; each lobe is about 2 mm. long and 1·25 mm. broad, and is pigmented at the apex.

In consequence of the discovery of this genital papilla a microscopic examination of a portion of one of the ovaries of the original type specimen was made, and it was found that in the ova as they lie *in situ* the development of the embryo is already far advanced.

Unfortunately the material is not in the best state of preservation, but the ova are still in a sufficiently good condition to show the general relations of the embryo.

The embryos are vermiform; they are about 1·5 mm. in length, and are closely applied to the yolk-sac, which they embrace through rather more than three-quarters of its circumference; the cerebral lobes, optic vesicles, and long free tail-fold are plainly apparent, but beyond these and the continuous bright line of the notochord nothing can now be made out; the yolk-sac is a little more than half a millimetre in the major diameter and a little less in the other diameters.

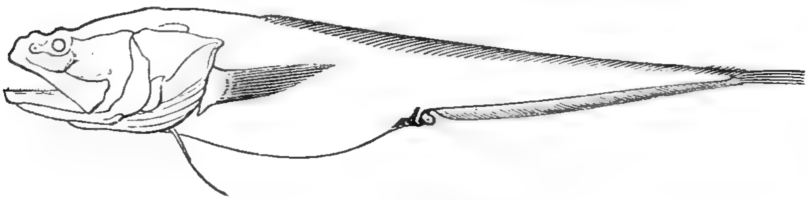
The fact of the viviparity of *Saccogaster maculata* being thus established, we may infer that the genital papilla of the male is an organ for effecting the internal impregnation of the ova.

In the female no copulatory modification of the oviduct can be made out; but the circumference of the genital pore is thickened and spongy.

In the males of two other Brotuline Ophidiids (namely, *Dinematichthys iluocœteoides* and *Bythites fuscus*) post-anal appendages have been described, and as a converse inquiry we may ask whether these two species may not be viviparous.

The inflated condition of the abdomen in *Saccogaster maculata* is doubtless directly related to the viviparous process; but it is interesting to note that this character is nearly as well marked in the adult male as in the adult female.

Again, the peculiar arrangement of the scales, which are scattered and non-imbricating, is probably one of the implications of intra-



Saccogaster maculata.

abdominal gestation; for it would facilitate the increasing distension of the abdomen which must follow the growth and enlargement of the embryos. And it is worthy of note that this character also is as conspicuous in the male as it is in the female.

The drawing represents the male of *Saccogaster maculata,* natural size.

These notes are, I am well aware, very incomplete. We require to know something of the histological appearances of the ovarian wall—whether or not it is furnished with glands or other structures which might supply nutriment to the developing embryo, through the yolk-sac or otherwise. We require to know more of the details of structure of the embryo—whether or not it possesses any organs for absorbing nutriment beyond that supplied by the yolk. But the scanty material available is not in a fit state for histological manipulation; and as the capture of a pregnant female of a particular species of deep-sea fish is not an event to be calculated upon with any certainty, I venture to present these rough notes on an interesting subject just as they are.

3. Observations on a rare Starfish, *Bathybiaster vexillifer*. By F. Jeffrey Bell, M.A., Sec. R.M.S.

[Received March 18, 1891.]

(Plates XXIII. & XXIV.)

Among much valuable material received last year by Dr. Günther from Mr. John Murray there was a specimen marked "*Archaster vexillifer*, Wyv. T. (unique)." This is, I doubt not, the type of the species shortly described by the late Professor Sir Wyville Thomson in his popularly written narrative of the cruises of the 'Porcupine.'[1]

This specimen, unfortunately, never came into the hands of Mr. W. Percy Sladen, who has given us ample details as to the Starfishes collected by the 'Challenger,' and as to most of those obtained by earlier and later deep-sea expeditions.

Messrs. Koren and Danielssen, the acute and talented describers of the Starfishes of the Norwegian North-Sea Expedition, when instituting[2] a new genus for the form which they first called *Astropecten pallidus*, suggested that Thomson's *Archaster vexillifer* should likewise be placed under *Bathybiaster*, and to this suggestion Mr. Sladen has assented.

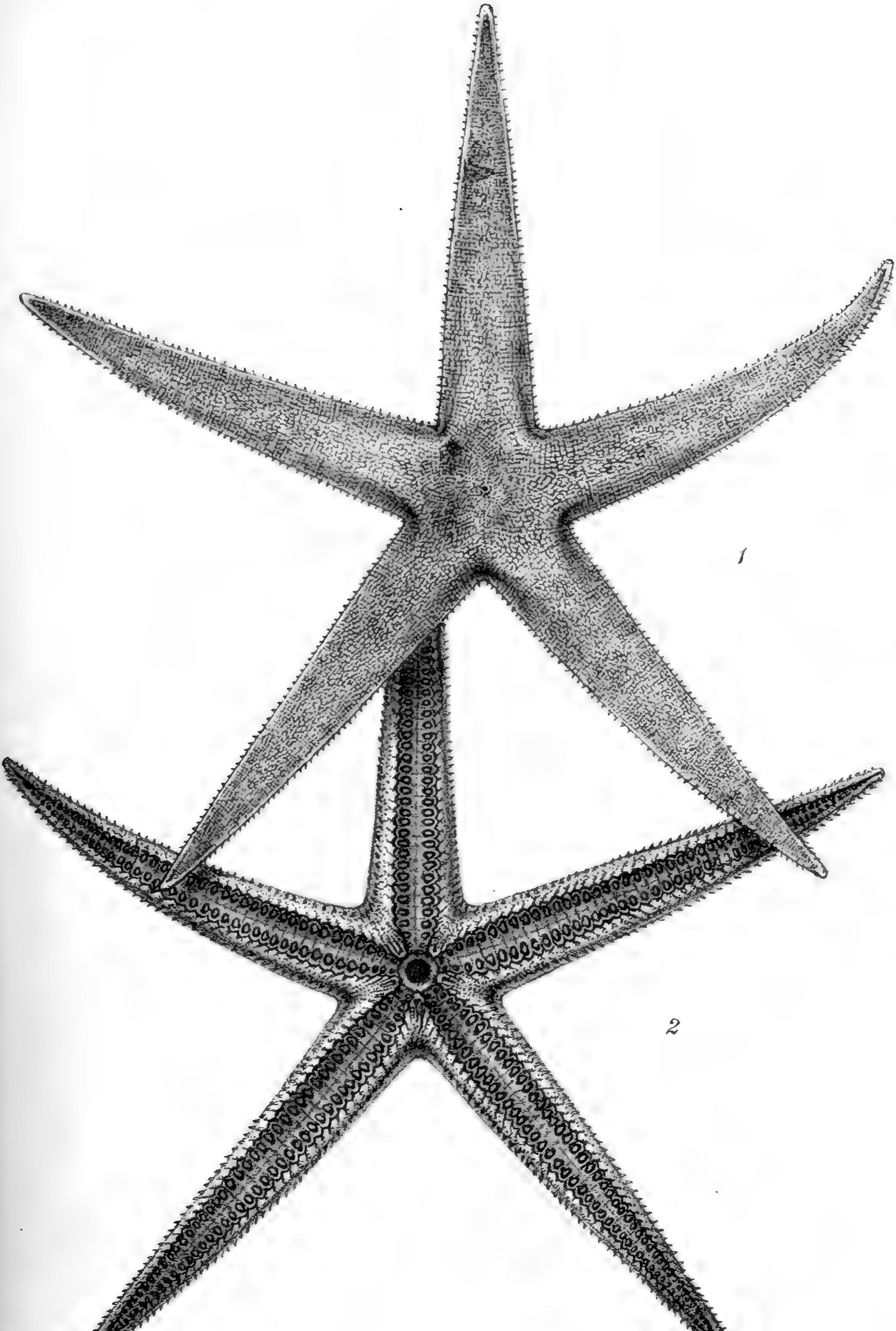
The rarity and interest of species of this group justifies, I think, a detailed account of Thomson's unique specimen, but that account cannot, unfortunately, be made as complete as it should, for the specimen has been dried.

General Form.—The species is, obviously, flattened, but in the drying the arms have been, unequally, drawn up so that the tips now point upwards, and the dorsal surface is more or less concave. The arms are very regularly triangular, 18·5 mm. wide at the base, and gradually and regularly tapering to a fine point; they are about 87 mm. long from the centre of the disc, the radius of which is 18 mm. The angle between the arms is rather sharp. The sides of the arms are straight and high at the base, where they measure as much as 12 mm.; the diminution in depth of the arms is brought about very gradually. The sides of the arms have a very stout appearance.

Ambulacra.—Wyville Thomson was fully justified in drawing attention to the remarkable width of the ambulacra, for they are nearly (8 mm. at the widest) half the whole width (17 mm.) of the arm, near the base, and this relation of groove to bounding plates is retained till quite near the tip of the arm. The proximate cause of this great width is to be found in the relative position of the ambulacral ossicles, which, instead of being set, as they ordinarily are, at an angle to one another, are set side by side and in one and the same plane; the median groove is so extraordinarily shallow that one cannot but be struck by the exposed condition of the ambulacral

[1] 'Depths of the Sea,' London, 1873, p. 150.

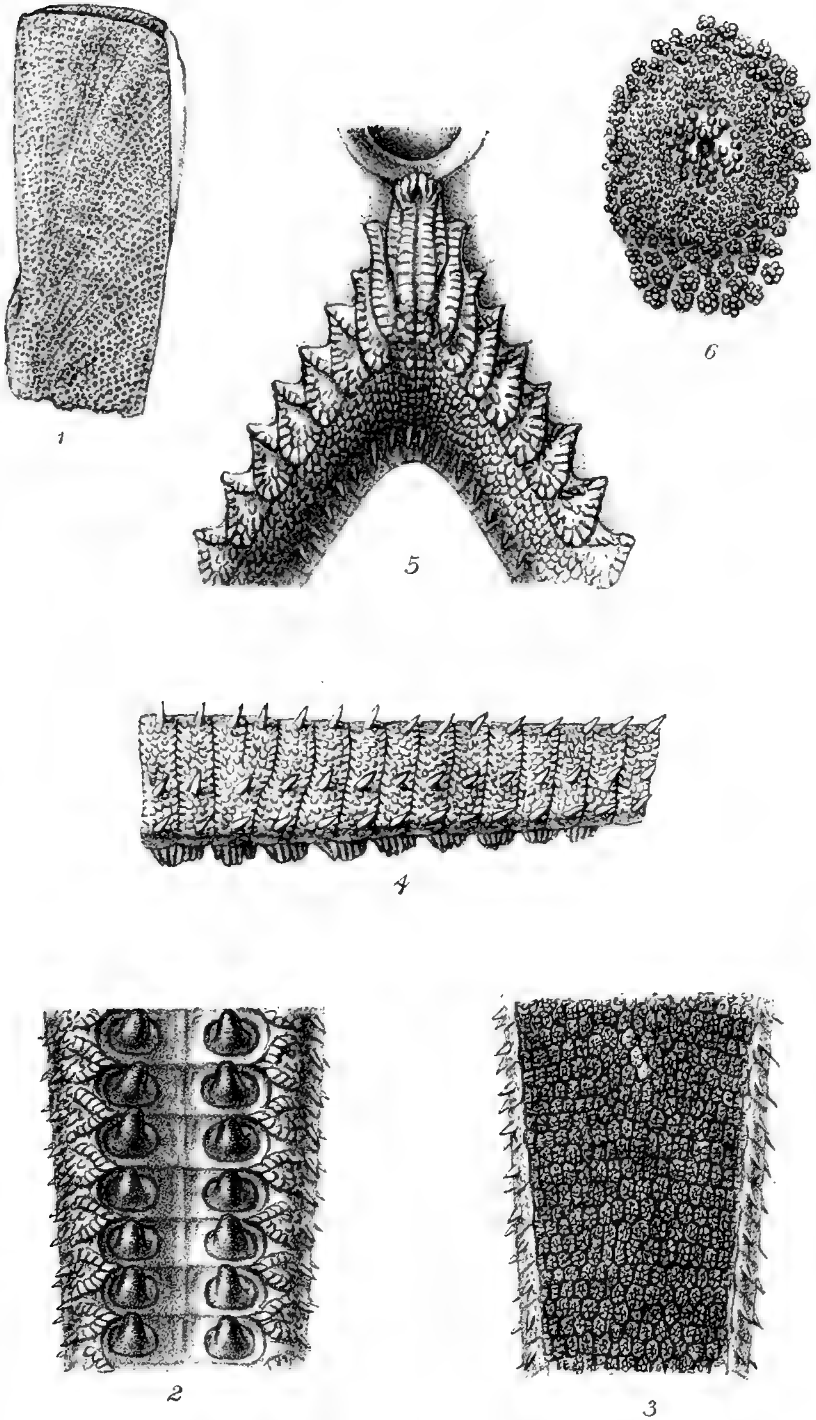
[2] Den Norske Nordhavs-Expedition, Zoologi—Asteroidea (1882), p. 89.



Berjeau & Highley, del. et lith.

Hanhart imp.

BATHYBIASTER VEXILLIFER.



Berjeau & Highley, del. et lith.

Hanhart imp.

BATHYBIASTER VEXILLIFER.

nerve-cord; the ossicles are broad and strong; the orifices for the passage of the tubes are very deeply set, and the walls are so excavated as to form a pit which shelves inwards (Plate XXIV. fig. 2). The adambulacral plates form projecting angles into the groove, and the sides of this angle are at right angles to one another. Fixed on the angle is a short spine and on either side there are generally four, none of which are long, all of which are blunt, and the three inner of which are much broader than the fourth or outermost. Attached to the spine at the angle is a blunt movable spine-like process, the possession of which is the cause of the specific name[1], and which may be, indifferently, spoken of as a "vexillum."

The single specimen has, as I have said, been unfortunately dried, and I can say nothing, therefore, as to whether or not there are, as in *Bathybiaster pallidus*, any elastic peduncle or strong muscular fibres, while the membrane which, apparently, surrounded the spine has shrivelled up in the drying. All that can be said, then, is that the spine has a shallow groove along its upper end, and that its sides are produced into fine denticulations (see Plate XXIV. fig. 1), which recall, though they by no means equal, the denticulation of the pedicellariæ of *B. pallidus*. It is to be hoped that the species, when next dredged, will be so preserved that a satisfactory and detailed account of these spines may be made.

The buccal apparatus is grooved, and projects well into the angles of the mouth (Plate XXIV. fig. 5); it is closely covered with two rows of about fifteen flattened stout subequal spines; the adambulacral plate on either side of it is elongated and flat, not angulated where it projects into the groove (Plate XXIV. fig. 5). The next distal plate has a long spine-bearing side and a much shorter side with no spines; the next has three spines on its shorter side, and in the next the proximal and distal sides of the plate are almost subequal, in the next they are equal. The dried ambulacral suckers are only slightly conical.

The intermediate plates in the interbrachial angle and along the sides of the ambulacra are densely covered with squamiform granulations (Plate XXIV. fig. 5), which become larger, looser, and more erect near the angles of the mouth and near the sides of the ambulacra.

The two rows of marginal plates (supero- and infero-marginal) are so closely approximated and covered with so uniform a granulation, that it is almost possible to believe that there is a single and not a double row of plates. They are strictly confined to the sides of the arms, which they form alone; the fact that the infero-marginal plates practically take no part in forming the lower surface of the arm may be explained by the flattening out of the ambulacral

[1] Described by Wyville Thomson in the following terms:—"The inner spine of each comb on the side of the ambulacral groove is longer than the others, and bears on the end a little oblong calcareous plate usually hanging from it somewhat obliquely like a flag, with sometimes a rudiment of a second attached to it in a gelatinous sheath, which makes it probable that it is an abortive pedicellaria."

groove. Along the top, the middle and the base of each side, there runs a row of short, sharpish spines; the uppermost of them is wanting near the disc and the lowermost fades out near the tip of the arm.

The arrangement of the paxillæ can be seen from the drawings given herewith; as there is but a single specimen I have not removed the upper plates or injured the type in any way (Plate XXIV. fig. 3).

There can be little doubt that this species has a small anus, and it will be remembered that Sir Wyville Thomson regarded it as an *Archaster* and not as an *Astropecten*. The definition of the genus as given by Messrs. Koren and Danielssen must be so far modified as to run "Anus present or absent" (*cf.* Plate XXIV. fig. 6).

The colour of the dried specimen is light yellow; Thomson states that during life it is of a pale rose, with a tinge of buff, the suckers semi-transparent and pale pink.

The single specimen recorded by Thomson was dredged at "Station 76" by H.M.S. Porcupine in 1869; Faeroe Channel, 60° 36′ N., 3° 9′ W., 344 fms.

The specific characters may be thus stated:—

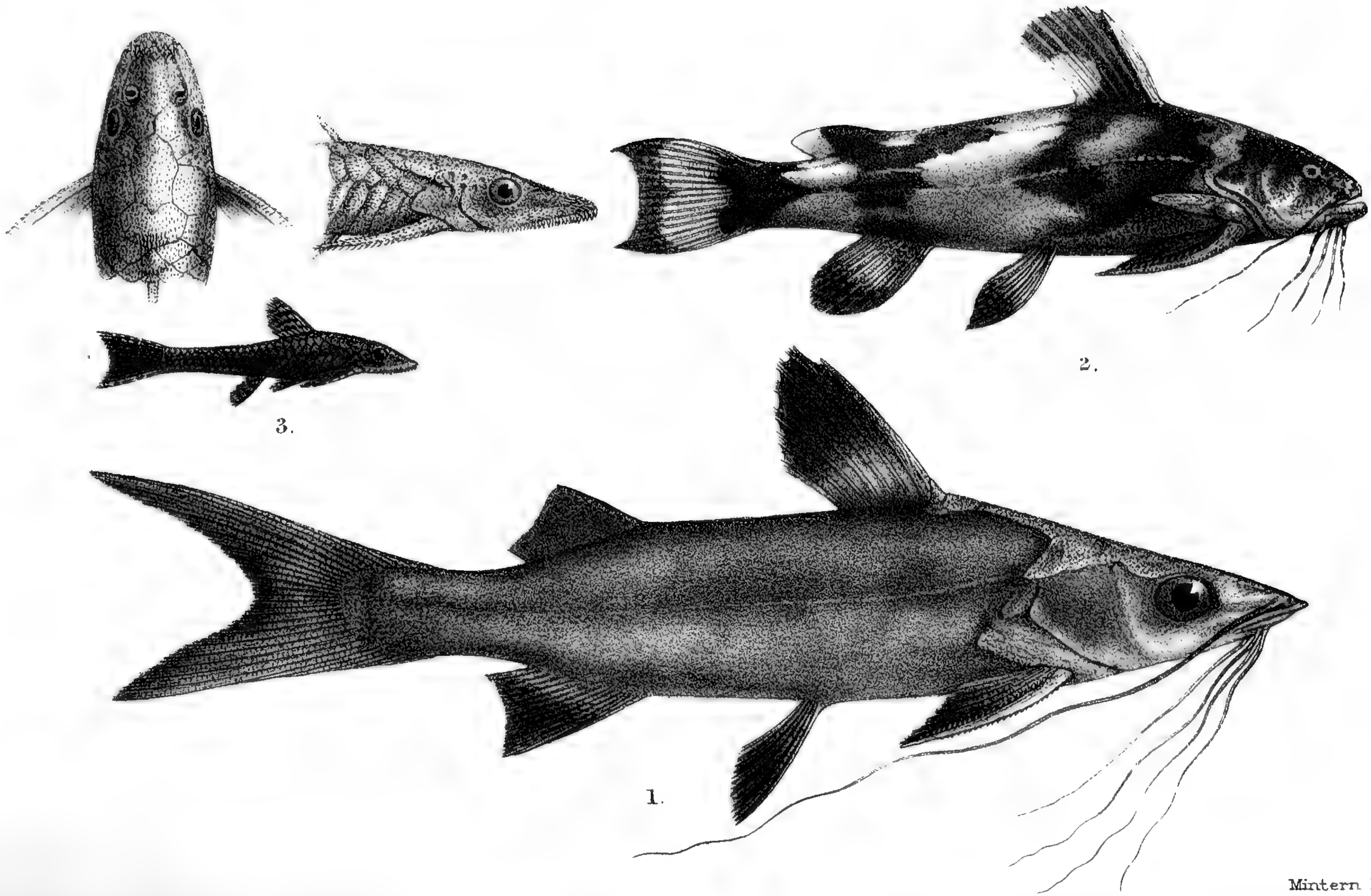
$$R = 5r.$$

Arms and disc flat, the former with deep vertical sides formed by the marginals, of which there are about 70 in each row; those of the superomarginal series have each a single short spine near the upper edge, and the inferomarginal similar and subequal spines near the upper and lower edges. The adambulacral spines are arranged by fours on two sides of a triangular plate, the apex of which looks into the furrow and bears a spine. Connected with this spine is a grooved spiniform body or "vexillum," which may be an aborted pedicellaria, and the edges of which are finely denticulated. A small anal orifice. Madreporite small, near margin of disc.

Generic Affinities.—The general characters of this form obviously ally it to *Bathybiaster*, as Messrs. Koren and Danielssen suggested, but it appears to be necessary to make some modifications of the original generic diagnosis.

The first statement is that the body is flat; to this *B. loripes* var. *obesa* is an exception.

The next is "5-rayed, with an extremely wide ambulacral furrow, having long pedunculated, peculiar pedicellariæ along its margins." I am inclined to suggest that the expression "peculiar pedicellariæ" might be replaced by the indifferent term "vexillum." Owing to the dried condition of Thomson's specimen, I cannot make any addition to or critical remark on the descriptions of previous writers, but it will be remembered that the learned Norwegian naturalists recognize the great differences between these appendages and normal pedicellariæ, and that Thomson says no more than that they may be "abortive pedicellariæ." In Mr. Sladen's species the structures at the sides of the ambulacral grooves are not pedunculate pedicellariæ placed on an adambulacral spine, and I very much doubt whether that form should



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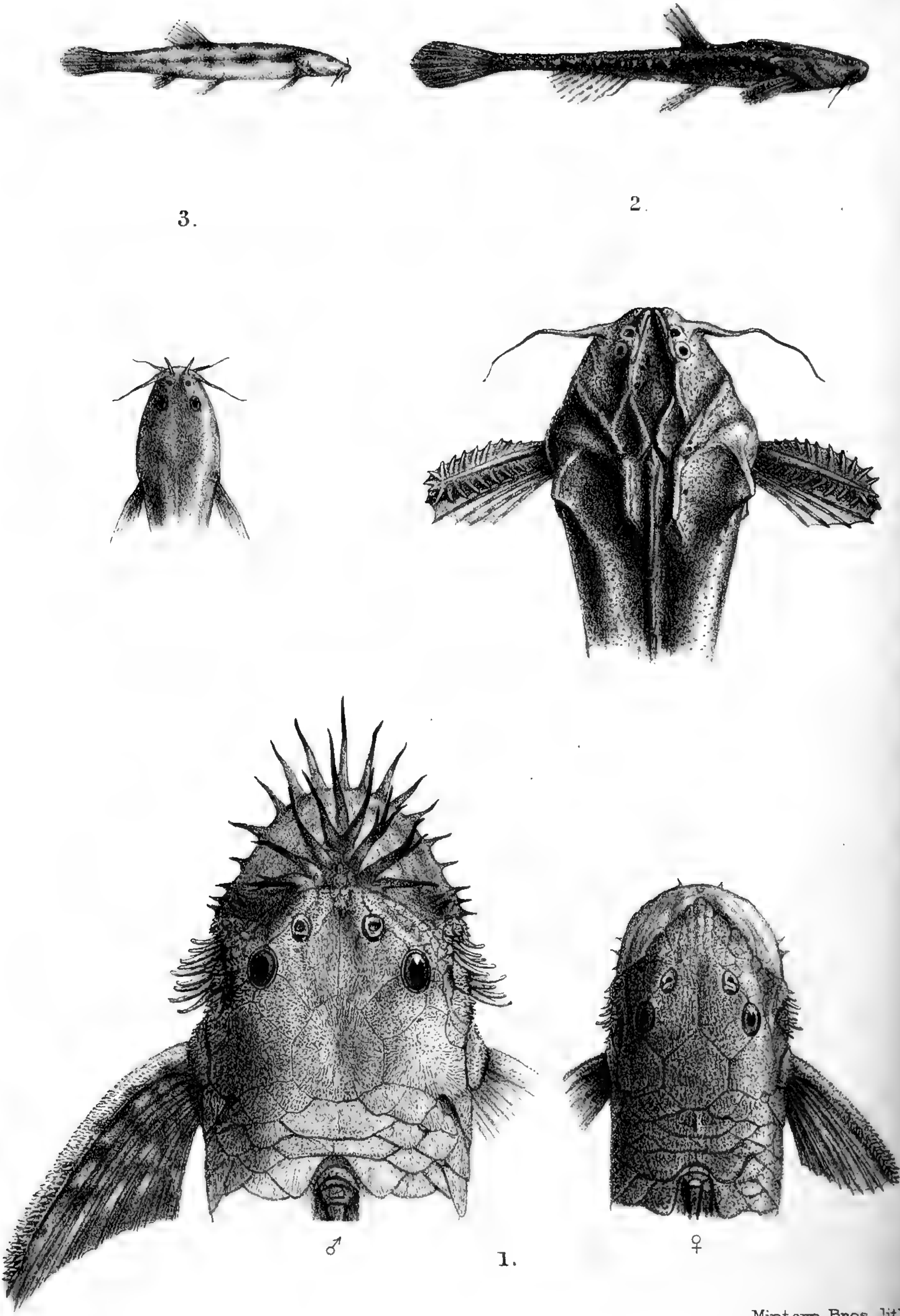
1. PIMELODUS NIGRIBARBIS. 2. PIMELODUS COTTOIDES. 3. OTOCINCEUS NIGRICAUDA.



Mintern Bros. lith.

1. CHÆTOSTOMUS CIRRHOSUS 2. BUNOCEPHALUS IHERINGI.
3. TRICHOMYCTERUS MINUTUS.

be regarded as congeneric with Thomson's or Koren and Danielssen's species. Might not the second section of the generic diagnosis run thus? : "5-rayed, with an extremely wide ambulacral furrow, some of the bounding spines of which bear vexilla"?

The diagnosis goes on, "The interbrachial space broad and closely beset with sessile pedicellariæ." I cannot from the figure given regard *B. pallidus* as having a broad interbrachial space, and *B. vexillifer* certainly has not; there is nothing in the dried specimen to justify our speaking of the scales which thickly cover this area as pedicellariæ, but I am not entitled to traverse Messrs. Koren and Danielssen's description; I would suggest that the lines run "The interbrachial space closely covered with pedicellaria-like scales."

I am by no means sure that *B. loripes*, Sladen, is a true *Bathybiaster*; it is not an Astropectinine, as the Astropectininæ are defined by Mr. Sladen; the ambulacral ossicles are set at an angle and not side by side, and the groove is not nearly so wide as in the two northern species.

Individual Peculiarity.—Here and there two superomarginals, apparently separated only in their upper half, correspond to one inferomarginal.

DESCRIPTION OF THE PLATES.

Plate XXIII.

Fig. 1. *Bathybiaster vexillifer* from above, to show the general form and appearance of the specimen.
2. The same from below, to show particularly the great width of the ambulacral grooves.

Both three fourths the natural size.

Plate XXIV.

Fig. 1. A "vexillum," × 20. *a*, The dried membrane attached to the spine shown *in situ*, as seen in the dried specimen.
2. The structure of the ambulacra, × 2.
3. The form and characters of the dorsal paxillæ, × 2.
4. A view of the side of the arm, × 2.
5. The mouth-plates and adjoining ossicles, × 2.
6. The region of the anus, × 4.

4. An Account of the Siluroid Fishes obtained by Dr. H. von Ihering and Herr Sebastian Wolff in the Province Rio Grande do Sul, Brazil. By G. A. Boulenger.

[Received March 21, 1891.]

(Plates XXV. & XXVI.)

During the last few years, the British Museum has received a great number of Fishes collected in the Province Rio Grande do Sul by Dr. H. von Ihering and Herr Sebastian Wolff. The recently published excellent synopsis of the American Siluroids by Dr. and

Mrs. Eigenmann[1] has induced me to make a thorough re-examination of the Siluroids collected by those gentlemen, the more so as Dr. Hensel's account[2] is much in need of revision.

1. Pimelodus (Pimelodella) lateristriga, Müll. & Trosch.[3]

2. Pimelodus (Pimelodella) nigribarbis. (Plate XXV. fig. 1.)

Pimelodus (*Pseudorhamdia*) *nigribarbis*, Bouleng. Ann. & Mag. N. H. (6) iv. 1889, p. 266.

D. 1/6. A. 17. P. 1/8.

Head bony above, granulated, once and two thirds to once and four fifths as long as broad; occipital process obtusely keeled, twice as long as broad, in contact with the basal bone of the dorsal spine; length of head thrice and a half to thrice and two thirds in the total (without caudal); eye rather large, its diameter four and a half times in the length of the head, once and a half in the length of the snout, twice in the interorbital space; maxillary barbel extending to the origin of the anal, outer mandibular to the extremity of the pectoral. Præmaxillary teeth present, but very feebly developed. Pectoral spine a little longer than dorsal, three fourths the length of the head, serrated on both sides. Dorsal fin much deeper than long, the spine strong, but little shorter than the anterior branched rays, two thirds the length of the head; adipose fin one sixth to one eighth of the total length (without caudal), two thirds to one half of its distance from the dorsal. Depth of body about one fifth of the total length. Caudal deeply forked, with the lobes pointed, the upper being the longer. Upper parts and fins powdered with black, most closely on the ventrals and anal and on the barbels, which are almost black.

Total length 155 millim.

I have now before me three specimens, from the Camaquam[4] or Icamaquam River. They differ from the description of *Pimelodus valenciennis*, Lütk., in the width of the head being more instead of less than half the length, and in the larger eye, the diameter of which is contained four and a half times instead of six times in the length of the head.

[1] Occasional Papers of the Calif. Acad. of Sc. i. 1890.

[2] Arch. f. Nat. 1868 & 1870.

[3] I have compared my specimens with one from the Rio das Velhas, described by Prof. Lütken, and received from the Copenhagen Museum. I have seized this opportunity to re-examine my *P. buckleyi* and compare it with a specimen from Macacos recently received from the Museum of Comparative Zoology under the name of *P. buckleyi*. In the types the pectoral spine is as long as the distance from the anterior border of the eye to the opercular border and practically smooth on its inner edge; in the specimen from Macacos the pectoral spine is stronger, as long as the distance between the base of the maxillary barbel and the opercular border, and its inner edge is distinctly though very feebly serrated. There can be no doubt that the two are distinct, and I venture to propose for the species described by Dr. and Mrs. Eigenmann as *P. buckleyi* the name of *Pimelodus* (*Pimelodella*) *eigenmanni*.

[4] Not Camapuam, as stated by mistake in the original description.

3. Pimelodus maculatus, Lacép.

4. Pimelodus (Rhamdia) hilarii, C. & V.

5. Pimelodus (Pseudopimelodus) cottoides, sp. n. (?). (Plate XXV. fig. 2.)

D. 1/6. A. 9–10. P. 1/5.

Head naked above, a little broader than long; occipital process very short, in contact with the basal bone of the dorsal spine, and two fifths the length of the latter; length of the head nearly one fourth of the total (without caudal); eye very small, hardly half as long as the snout; maxillary barbel extending to the middle of the pectoral spine, outer mandibular extending as far as the maxillary, mental a little shorter. The band of præmaxillary teeth of moderate breadth, without prolonged lateral portion. Pectoral spine very stout, very strongly serrated along its inner, less so along its outer edge; humeral process strong, half as long as pectoral spine. Distance between end of snout and dorsal spine one third or two fifths of total length (without caudal); dorsal fin considerably deeper than long; adipose fin as long as dorsal, separated from it by a space not quite twice its length. Depth of body one fourth total length (without caudal). Caudal emarginate. Handsomely marked dark brown and pale reddish brown above, the latter colour forming a band across the nape, a spot on each side of the body, below the middle of the dorsal, a broad band behind the dorsal, an oblong spot in front of the adipose fin, and a band round the tail, involving the end of the adipose fin; dorsal fin dark brown, with a whitish spot occupying the basal half of its posterior moiety; pectoral dark brown, with a small basal whitish spot; anal whitish in the middle, crowded with dark brown spots at the base and in its distal moiety; ventrals whitish at the base, crowded with dark brown spots on the remainder; caudal whitish, with a distal crescentic band of closely-set dark brown spots; barbels annulate with black; lower parts pale brown, marbled with dark brown.

Total length 92 millim.

Two adult and several young specimens from the Camaquam River.

I should have referred these specimens to Valenciennes's *P. charus* but for the fact that it is identified by Steindachner with *P. bufonius*, C. & V., a species with a very different dentition. The nearest ally of *P. cottoides* would then be *Pseudopimelodus parahibæ*, Stdr., with which it is possibly identical. The proposal of a new name is, however, justified, even should the two species be the same, as the name *parahibæ* is preoccupied in the genus *Pimelodus* for a species of the subgenus *Rhamdia* (*R. parahibæ*, Stdr.).

6. Heptapterus mustelinus, Val.

Numerous specimens, from 42 to 220 millim. They vary greatly, irrespective of size, in the elongation of the body, the length of the head being contained from five times and one third to six times and a half in the total (without caudal). The number of anal rays varies from 19 to 23.

7. Arius commersonii, Lacép.

Notes on the habits and development of this Siluroid in the Laguna dos Patos have been published by Dr. v. Ihering, Biol. Centralbl. viii. 1888, p. 268.

8. Genidens cuvieri, Cast.

9. Callichthys asper, Q. & G.

I agree with the Eigenmanns in referring *C. affinis*, Gthr., and *C. hemiphractus*, Hens., to this species. The Rio Grande specimens have usually $\frac{27}{26}$ scutes; and I may add that we have a specimen from Bahia with as many as $\frac{29}{27}$.

10. Callichthys (Corydoras) paleatus, Jen.

11. Loricaria anus, Val.

In a large specimen, 420 millim. long, the length of the first dorsal ray is $1\frac{1}{10}$ in the length of the head (to extremity of occiput), and the diameter of the orbit (without the notch) is $4\frac{1}{2}$ in the length of the snout. In a small specimen, measuring 170 millim., the length of the first dorsal ray is $1\frac{1}{6}$ in the length of the head, and the diameter of the eye $2\frac{3}{4}$ in the length of the snout. Two or three minute teeth are present on each side of the upper jaw. Upper caudal lobe considerably longer than the lower.

12. Loricaria lima, Kner.

Although I have examined but three specimens, two of which I would refer to *L. strigilata*, I am much inclined to agree with Dr. v. Ihering (*in litt.*) in regarding *L. strigilata* and *L. cadeæ* of Hensel as based on variations of *L. lima*.

13. Otocinclus nigricauda, sp. n. (Plate XXV. fig. 3.)

D. 1/7. P. 1/5. V. 1/5. A. 1/5. L. lat. 23–25.

Closely allied to *O. affinis*, Stdr., but snout more rounded, eye rather smaller, its diameter two fifths the length of the snout, and ventral shields more numerous and irregular, forming five to seven longitudinal series. The coloration is very different from that of *O. affinis*. Dark olive-brown above; dorsal, anal, and paired fins with the rays barred black and white; caudal deep black, with the outer rays spotted with white.

Total length 42 millim.

Several specimens.

14. Plecostomus commersonii, Val.

15. Chætostomus cirrhosus, Val. (Plate XXVI. fig. 1.)

I give figures illustrating the very marked differences between the heads of male and female as shown by specimens from Dr. v. Ihering's collection. In addition to the rostral appendages and the stronger præopercular armature, the male differs in the longer pectoral fin, which extends to the middle of the ventral spine instead of to its base.

16. Bunocephalus iheringii, sp. n. (Plate XXVI. fig. 2.)

D. 5.[1] A. 9. P. 1/4. V. 6.

Head much depressed, its depth twice in its width, once and one third in its length; upper jaw not projecting; cranial ridges feebly prominent; interorbital space concave, one third the width of the corresponding part of the head; maxillary barbel extending a little beyond the base of the pectoral; mental barbel half as long as and not reaching to postmental. Pectoral spine slightly curved, the terminal hooks largest; coracoid process slightly divergent, extending to middle of pectoral spine and beyond humeral process. Dorsal fin nearer the end of the snout than to the caudal. Hind portion of the tail compressed. The length of the caudal fin contained about five times in the total length. Skin everywhere covered with small warts. Dark brown above; a blackish lateral stripe, with small greyish spots; greyish white below.

Total length 60 millim.

Two specimens.

The only other described species with 9 anal rays, *B. aleuropsis*, Cope, from Pebas, Ecuador, differs in the longer maxillary barbel, which is said to reach the middle of the pectoral spine. The discovery of this new species extends the range of *Bunocephalus* considerably southwards.

17. Trichomycterus brasiliensis, Lütk.

18. Trichomycterus minutus, sp. n. (Plate XXVI. fig. 3.)

D. 8. A. 6.

Length of head two ninths of the total (without caudal); eye a little nearer the end of the snout than to the opercular border, measuring two thirds the interorbital width; gill-opening not continued forward to below the eye; maxillary barbels three fifths the length of the head, not reaching the gill-opening; nasal barbels short, extending to the eye. Dorsal fin entirely in front of anal; none of the fin-rays prolonged; the origin of the dorsal midway between the end of the snout and the extremity of the caudal. Caudal fin rounded. Pale brown above, with three longitudinal series of large squarish dark brown blotches; fins immaculate.

Three specimens from the San Lorenzo district.

The largest measures only 40 millim.

EXPLANATION OF THE PLATES.

Plate XXV.

Fig. 1. *Pimelodus* (*Pimelodella*) *nigribarbis*, Blgr.
2. *Pimelodus* (*Pseudopimelodus*) *cottoides*, Blgr.
3. *Otocinclus nigricauda*, Blgr.

Plate XXVI.

Fig. 1. *Chætostomus cirrhosus*, Val. Upper views of heads of male and female.
2. *Bunocephalus iheringii*, Blgr.
3. *Trichomycterus minutus*, Blgr.

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[1] The last ray is adnate.

5. Notes on the Anatomy of *Dolichotis patagonica*. By Frank E. Beddard, M.A., Prosector to the Society.

[Received April 7, 1891.]

I am not acquainted with any paper dealing with the structure of this Rodent; the following notes may therefore be of some use.

Alimentary Canal and Viscera.

The *hard palate,* as in many Rodents, is narrow anteriorly, and the ridges are in consequence much reduced and modified. The accompanying drawing (fig. 1, p. 237) shows that they are only represented by two pad-like structures (*a*), each of which terminates in a pair of horny processes directed backwards; those of the posterior ridge are the longest. As the palatal ridges are characteristic in various Rodents, I have thought it worth while to illustrate their very peculiar form in *Dolichotis.* There are no ridges at all between the molar teeth; the mucous membrane is there perfectly smooth.

The *tongue* is divisible into two regions—a broadly oval tract behind and a narrow long anterior portion; the former has two circumvallate papillæ, and a large "Mayer's organ" on each side measuring about half an inch in length.

The *intestines* measure altogether 18 feet 6 inches.

The *cæcum* is large; it measures along the greater curvature, from the free extremity to the exit of the colon, about 18 inches; these measurements apply to the gut when distended with alcohol.

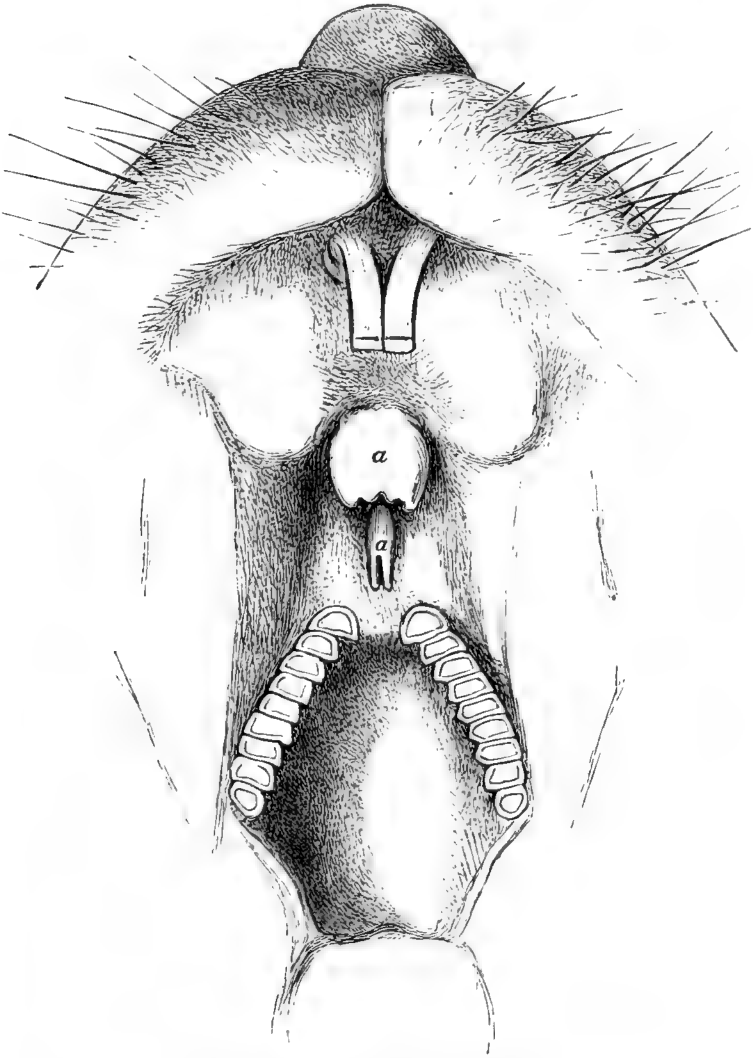
Its structure appears to be a little similar to that of the Capybara as described by Garrod[1]; both the ileum and colon open into a pouch separated by an incomplete valve from the rest of the cæcum; their apertures are not very close together, about an inch apart; the aperture of the colon is guarded by a sphincter. One lip of the ileo-cæcal orifice is formed by the fold which divides the cæcum proper from the colic pouch. From the sphincter valve of the colon three ridges like the typhlosole of the earthworm's intestine pass along its inner surface; these are in addition to the numerous closely-set fine ridges which traverse the first part of the colon running parallel to each other; these latter are very evident in the cæcum of the Paca, of which I have a dried specimen.

The first of these ridges can only be followed for a short way; the other two, on the contrary, extend for a very long way down. I

[1] "On the Cæcum coli of the Capybara (*Hydrochœrus capybara*)" P. Z. S. 1876, p. 19. Garrod, however, states in that paper that "neither in *Cavia*, *Dolichotis*, *Capromys*, nor in any of the allied forms with which I am acquainted, does the strong sigmoid curve of the large intestine, at the commencement of the sacculated cæcum, develop into a true secondary cæcum in the manner that it does in the Capybara." The difference appears to be chiefly in the fact that the colon in Capybara is prolonged beyond its opening, thus forming the second cæcum; the arrangement in *Dolichotis* is more like that of *Erethizon* as figured and described by Mivart. I may mention that in *Sphingurus prehensilis* there is no such separation of the cæcum into two chambers.

traced them for the distance of one foot from the sphincter, but I do not know how much further they extended. These two ridges,

Fig. 1.



Palate of *Dolichotis patagonica.*
a, processes upon palate representing palatal ridges.

as shown in the accompanying drawing (woodcut, fig. 2), are at first some distance apart (about $\frac{3}{4}$ of an inch); they become gradually closer until they are only separated by a little less than half an inch; they then run parallel. These ridges are clearly very like those of *Aulacodus swindernianus* figured and described by Garrod[1]; they are

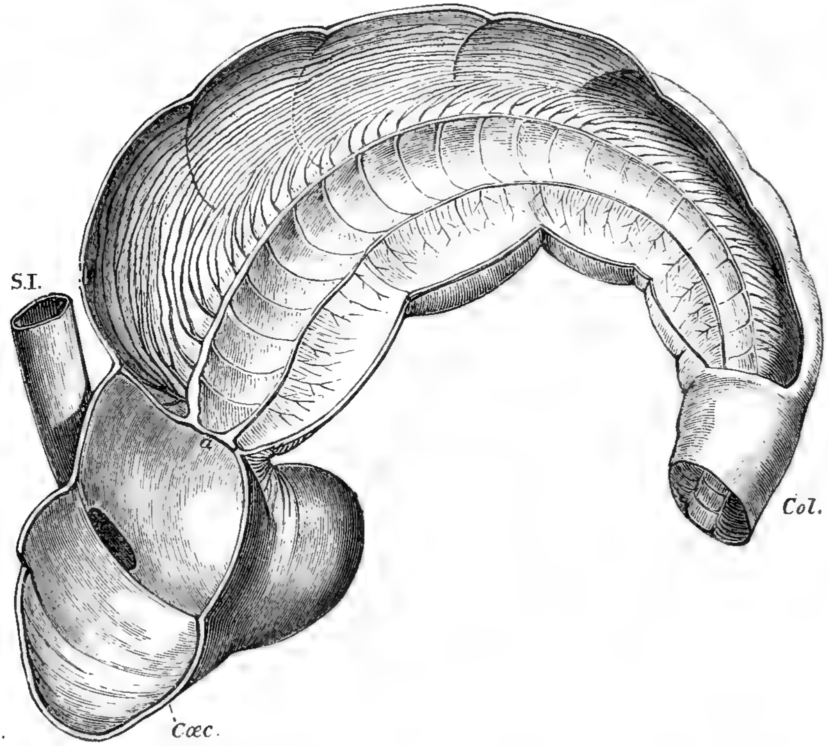
[1] "On the Visceral Anatomy of the Ground Rat (*Aulacodus swindernianus*)," P. Z. S. 1873, p. 786.

slightly "puckered" in the same way, and posteriorly run parallel to each other "like railway-lines"; but in *Dolichotis* the intestine is sacculated between these two bands, which causes the appearance of a number of transverse ridges between them like railway-sleepers.

The cæcum has externally, as in *Erethizon*, three longitudinal bands; its extremity is blunt.

The *liver* is not unlike that of the Porcupine, though the proportions

Fig. 2.



Portion of colon and cæcum of *Dolichotis patagonica*.

a, valve of colon; *Cæc.*, commencement of cæcum; *S.I.*, small intestine; *Col.*, colon.

of the lobes are a little different. The left lateral lobe is the largest; the right and left centrals are about equal to each other and to the right lateral: the lobes are not much divided, the caudate and Spigelian are well-marked; a gall-bladder, so variable in its occurrence in Rodents, is present.

The *heart* gives off *one* innominate artery.

The *lungs* are made up of two lobes on the left and three on the right side besides the lobus impar; the upper lobe of the left side is nearly divided into two.

The right *kidney* is a little in advance of the left, about half an inch.

The *generative organs* have large vesiculæ seminales, each about 3 inches in length.

Some of the Muscles.

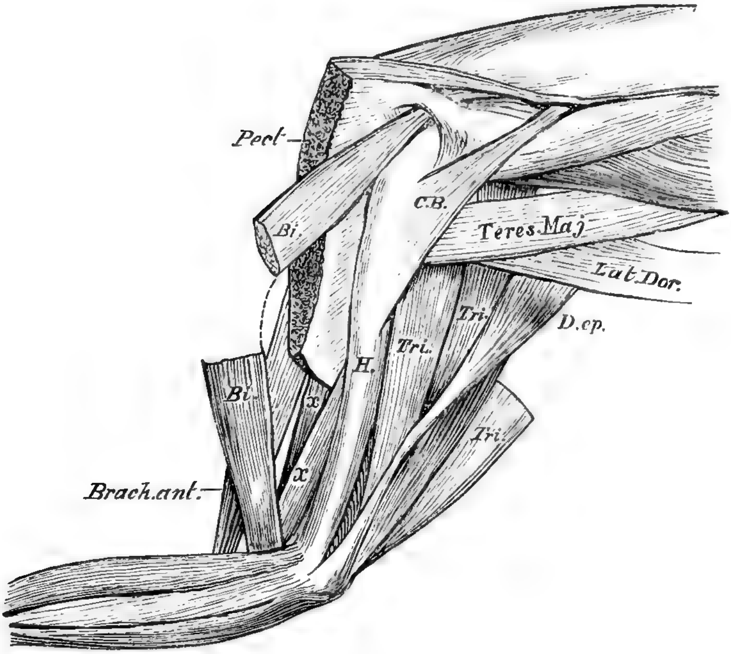
In dissecting the muscles of *Dolichotis* I have confined myself to those of the limbs and for the most part to the flexors and extensors of the limbs.

I commence by describing those muscles which I have dissected, and shall presently point out the resemblances to other Rodents.

Muscles of the Fore Limb.

The *Trapezius* is a very extensive muscle, its origin extends back as far as the last rib ; it is continuous in front with a strongly tendinous fascia which passes into a thick layer of muscle, forming thus an almost separate anterior portion of the muscle. The hinder

Fig. 3.



Arm muscles of *Dolichotis patagonica.*

Pect., pectoralis primus ; *C.B.*, coraco-brachialis ; *Bi.*, biceps ; *Brach. ant.*, brachialis anticus ; *Tri.*, triceps ; *Lat. Dor.*, latissimus dorsi ; *D. ep.*, dorso-epitrochlear ; *H.*, humerus ; *Teres Maj.*, teres major ; *x*, second part of brachialis anticus.

part of the trapezius is attached to about the middle of the spine of the scapula ; this insertion is continuous with that of the anterior part of the muscle, which is to the metacromion and by fascia on to outer muscles of humerus ; this insertion is partly covered by that of the panniculus carnosus.

The *Latissimus dorsi* is not attached to the infraspinatus, as it is stated to be in the Agouti by Messrs. Murie and Mivart ; its insertion is on to humerus by tendon in common with the teres major; it gives off, as is so usually the case in this group of animals, a *dorso-epitrochlear* slip which runs to elbow.

The *Teres major* arises from about the upper half of the posterior margin of the scapula; it is inserted, as already mentioned, in common with the latissimus dorsi by a flat tendon about half an inch long and rather more than half an inch broad at its insertion.

The *Deltoid* consists of two more or less distinct portions—one arising from the spine of the scapula and apparently also from the fascia covering the infraspinatus; the smaller part of the muscle springs from the acromion and metacromion; the two are inserted in common on to the deltoid ridge by an insertion which is fleshy above but tendinous below.

The *Pectoralis primus* is much blended with the panniculus carnosus; its insertion is shown in the accompanying drawing (woodcut, fig. 3) to extend a long way down the humerus.

The *Triceps* consists of four distinct parts, or of five if the dorso-epitrochlear be reckoned as belonging to the *Triceps*. The first part arises from scapula and also from the fascia covering the infra-spinatus; the second part is blended at its origin with the insertion of the infraspinatus; it arises from the neck of the humerus and from the deltoid ridge. The third part is smaller; its origin is tendinous from the neck of the humerus just below the insertion of the teres major and latissimus dorsi. The fourth part is entirely fleshy and arises from the greater part of the shaft of the humerus.

The *Coraco-brachialis* arises from the coracoid by a strong flat tendon; its insertion is also tendinous for the greater part and extends for some way down the humerus, beginning with the head; the posterior part of its insertion is fleshy.

The *Biceps* has only a single origin and a single insertion on to the ulna.

The biceps is also inserted in common with a peculiar muscle shown in the accompanying drawing (woodcut, fig. 3, *x*); this muscle arises by two fleshy heads from the humerus, one on either side of the insertion of the pectoralis.

The *Brachialis anticus* curves round the arm as it does in other Rodents; it has a tendinous insertion on to the ulna beyond that of the biceps.

The *Pronator radii teres* is not a very strong muscle; it arises from the outer condyle of the humerus and is inserted on to the radius.

The *Flexor metacarpi radialis* is the next muscle to the pronator radii teres; it is attached by a long tendon to the second metacarpal (= 3rd digit) near to the proximal end.

The *Flexor carpi ulnaris* is attached in the usual way by a very stout tendon.

The *Flexor sublimis* arises in common with the flexor profundus; it divides into three delicate tendons which supply digits 2, 3, and 4.

The *Flexor profundus* and *Flexor pollicis longus* are difficult to distinguish; the common tendon arises from the fusion of four more or less distinct muscular heads. Two of these arise from the condyle of the humerus, one of them (the more superficial) being much larger than the other. The two remaining heads arise respectively from the radius and ulna.

The *Extensor metacarpi radialis* is a large muscle, the largest of the extensors; its tendon is inserted on to outer side of metacarpal of 3rd digit, having previously given off a slip to the head of the first metacarpal (*i. e.* that of 2nd digit).

The *Extensor communis digitorum* arises not only from the external condyle of the humerus, but also by a few fibres from the ulna; its tendon splits at the wrist into four tendons supplying the four digits.

The *Extensor minimi digiti* is the smallest of the three upper extensors; it arises from extensor condyle and from ulna; it supplies 4th and 5th digits.

The *Extensor carpi ulnaris* calls for no special remark; it is as in the Agouti.

These are all the extensors of the manus of *Dolichotis*.

Muscles of the Hind Limb.

The *Gracilis* consists of two distinct parts as in other Rodents. One part of the gracilis is sometimes spoken of as *sartorius*; the muscle is inserted on to fascia covering leg from knee to ankle-joint; it also appears to have a tendinous connection with both the semimembranosus and semitendinosus.

The *Semitendinosus* is a strong and fleshy muscle; it arises from the spines of the sacral vertebræ and from the tuberosity of the ischium; it is inserted by a moderately broad flat tendon, which becomes thicker at its insertion to outside of cnemial crest of tibia.

The *Biceps* has two origins—(1) from sacral vertebræ in front of the semitendinosus and continuous with it; (2) from tuberosity of ischium, also in front of semitendinosus. It is inserted by a continuous broad sheet of muscle on to fascia covering leg.

The *Tibialis anticus* arises by two heads—(1) by a long tendon from the femur which passes beneath the patello-tibial ligament; (2) by a fleshy head from tibia and fibula. The two parts are blended a short way down and inserted by a strong tendon on to inner side of inner metacarpal.

The *Extensor communis* arises by a long tendon from the femur; its tendon of insertion passes under two annular ligaments, one at ankle-joint through which the tendon of the tibialis anticus also passes, and another near the proximal end of the metacarpal; just before passing through the second annular ligament the tendon splits into two; each of these again splits into two; the two outer of the four tendons supply the two outer digits; the two inner ones both go to the middle digit.

The *Extensor hallucis* is a slender muscle arising from the tibia and fibula; its tendon does not pass through the lower annular ligament; it supplies the second digit.

The *Extensor brevis* is a small flat triangular muscle, two tendons arise together from the muscle and supply the two inner digits.

The only Peroneal muscles present are the *Peroneus longus* and the *Peroneus quarti digiti*; the latter has an attachment to ankle as well as to 4th digit.

There are three long flexors.

The *Flexor communis* overlies the *Tibialis posticus*; their tendons join at the ankle; the tendon of the *Flexor hallucis* joins the common flexor tendon a little further down just before its trifurcation. *Interossei* form a thick mass covering sole of foot. There is only *one Lumbricalis* arising from flexor tendon of outer digit.

The myology of the Guinea-pig is to a considerable extent described by Messrs. Murie and Mivart in their memoir upon the Agouti[1]; it presents a number of differences from *Dolichotis*, of which the following are the principal:—

(1) There is no second part to the brachialis anticus, arising from the humerus[2].
(2) The Triceps has only three heads.
(3) The Flexor sublimis has four tendons.
(4) There are several extensor muscles of the hand not present in *Dolichotis*.
(5) Peroneus brevis present.

In most of these points *Dolichotis* also differs from the Agouti—in all except as to the second part of the *Brachialis anticus* (see footnote).

On the whole in myology *Dolichotis* is nearer to the Agouti than to the Porcupines, but it differs from both in the reduction of the extensors of the manus and the peroneal muscles.

There are at present so few Rodents of which the myology is known that I do not propose to deal with the resemblances of *Dolichotis* to such types as are known at greater length.

Brain.

As there is no description known to me of the brain of this Rodent and no figures, I endeavour to supplement this deficiency.

The brain (see fig. 4, p. 243) measures 59 mm. in length (to the end of the cerebellum) and 41 mm. greatest breadth.

The corpora quadrigemina are well exposed, as is the case with most Rodents, but not in the Squirrel and Porcupines.

The cerebral hemispheres are provided with well-marked sulci, which are more numerous than in a brain of *Cœlogenys paca* of about the same size.

The relation between the size of the animal and the complexity of the cerebral convolutions is not so plain in the Rodents as in some other groups; the Porcupines form the principal exception; they have all very smooth brains, as compared with other Rodents of a similar size or even smaller.

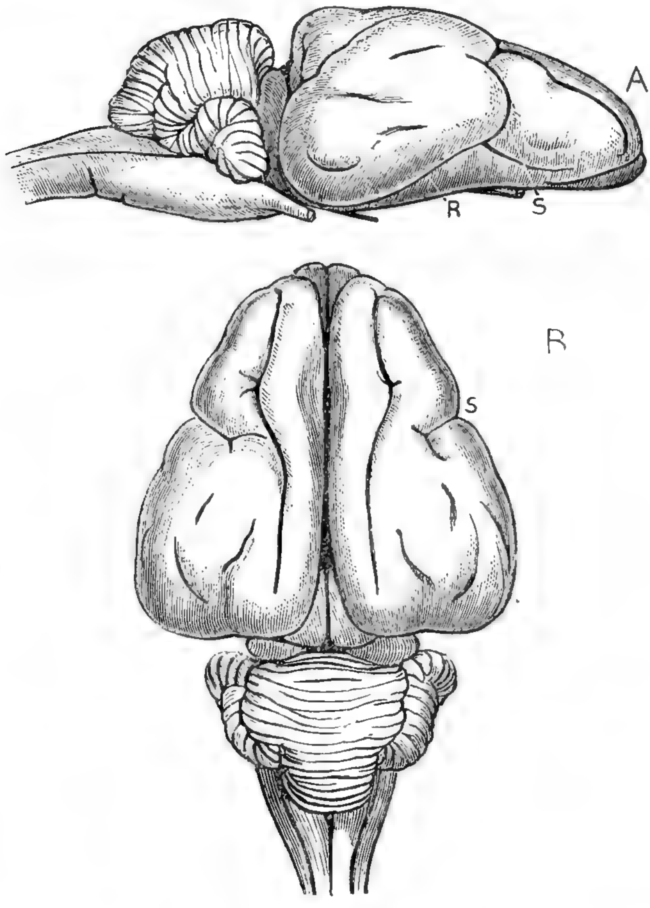
The Rhinal fissure of *Dolichotis* is deeper behind than in front;

[1] P. Z. S. 1866, p. 383.

[2] I think that the muscle which I figure (woodcut, fig. 3, *x*) must correspond to the one so named in the Agouti, though its insertion is quite different in *Dolichotis*.

the Sylvian fissure is very deep; it passes forwards and then backwards, forming a line which is convex anteriorly; after this it bends forwards at a sharp angle and nearly joins the principal longitudinal sulcus (see fig. 4). The upper surface of each cerebral hemisphere is marked by a strong sulcus running with a sinuous outline approximately parallel to the long axis of the brain; these sulci commence a little way in front of the hinder margin of the

Fig. 4.



Brain of *Dolichotis patagonica*.

A, from the side; B, from above: *S*, sylvian fissure; *R*, rhinal fissure.

brain; anteriorly each bends outwards and joins the rhinal sulcus; the other fissures are of less importance and are illustrated in the drawing exhibited (fig. 4).

I have been able to compare the brain of this species with those of the following Rodents at present in my possession:—

Castor fiber (a cast of the brain [1]),

[1] For this and several other casts of the brain itself, *not* of the cranial cavity, I am greatly indebted to Prof. d'Arcy Thompson.

Lepus cuniculus,
Sciurus vulgaris,
Cœlogenys paca,
Sphingurus prehensilis,
Cavia porcellus,
Lagostomus trichodactylus,

and with the following Rodents known to me only by descriptions and figures :—*Erethizon dorsatus* (Mivart, "Notes on the Anatomy of *Erethizon dorsatus,*" P. Z. S. 1882, p. 250, woodcut fig. 7); *Pectinator spekii* (Peters, "Contributions to the Knowledge of *Pectinator* &c.," Trans. Z. S. vol. vii. p. 405, pl. 50. figs. 7–10); *Hystrix* (Owen, 'Comp. Anat. of Vertebrates,' vol. iii. p. 110, fig. 77, and Gratiolet and Leuret, Comp. Anat. Syst. nerv. pl. iii. figs. 1, 2); *Castor*, Agouti, Paca, Water-Rat, Squirrel, Rabbit (all figured in the work just referred to).

In comparing the brain of *Dolichotis* with those of the other types mentioned in the above list, I have paid particular attention to the classificatory importance of this structure. The primary division of the Rodentia into *Duplicidentati* and *Simplicidentati* is borne out by the characters of the brain. In the brain of the Rabbit the lateral lobes of the cerebellum form an angle with the middle lobe and reach rather further forward, while the flocculi stand out prominently. The rhinencephalon is sharply bent down, and the posterior half forms an exceedingly prominent convex projection. These characters are not met with in the other genera that I have examined. At the same time I cannot find any characters except negative ones that bind together the Simplicidentati.

Lagostomus and *Cœlogenys* are most like *Dolichotis,* but in the two former the furrow dividing the external gyrus is broken in the middle. In *Cœlogenys* the Sylvian fissure is hardly marked, but the rhinal fissure is exceedingly deep; *Cœlogenys* shows a further point of agreement with *Dolichotis* in the presence of a supraorbital sulcus; this extends further back, running parallel with the rhinal fissure in *Dolichotis.* The most important fissure in the pallium of the Rodent's brain is clearly the one which bounds the external gyrus. In the Rabbit and Guinea-pig, which have nearly smooth brains, traces of this furrow exist for a short extent posteriorly. Probably the dints on the upper surface of the brain in the Porcupines are still further reduced traces of the same furrow. I may take this opportunity of mentioning that the brain of *Sphingurus prehensilis* agrees very closely with Mivart's description and figures of the brain of *Erethizon dorsatus.* I cannot indeed detect any point in which they differ.

On the whole it seems that the anatomy of *Dolichotis* brings it into relation with the Agoutis rather than the Porcupines.

April 21, 1891.

Prof. Flower, C.B., LL.D., F.R.S., President, in the Chair.

The following note on a Mungoose (*Herpestes mungo*) breeding during domestication, by Lieut.-Col. Sir O. B. St. John, K.C.S.I., R.E., F.Z.S., was read:—

"Early in November 1889 my daughter bought a young female Mungoose in Madras. It was apparently about six weeks old. It soon became extremely tame, ran about the house as it liked, but always slept at the foot of its mistress's bed. It accompanied us on a two months' tour in Coorg, during which, though it travelled in a box, it was at liberty at other times; it went with us to Ootacamund, and was in short thoroughly domesticated. It was never remarked in company with wild brethren, but about the middle of September showed signs of approaching maternity, and on the 20th gave birth to two kittens in some hole which we could not find. The mother reappeared the next day for food, but the young ones were not seen for a month or more, when they were as big as she had been when purchased. One has since disappeared, and the other, now almost as big as its parent, accompanies her to the house for food, but will not allow itself to be touched. The mother is as tame as ever, but spends less time in the house and more in the grounds than she used to. It may be gathered that the Mungoose, in Southern India at least, begins to breed at a year old, drops its kittens about September, and has two or perhaps more at a birth. Early in September 1883 I saw a family of a mother and three young ones of *Herpestes auropunctatus* in Kashmir, and the next day caught one of the kittens, which I judged to be about two months old. It proved untamable and I liberated it, and never saw it again. In the first or second week in December 1882 I bought a young female *H. mungo* in Bombay, which was, I should say by the light of my later experiences, two to three months old. This little beast became extremely tame and affectionate, and accompanied us in many wanderings from Kashmir to Bangalore, and from Quetta to England. As she grew old she became gradually averse to strangers, and took to avoiding the house when any were staying with us. At last, after seven years' domesticity, she came to the house during our temporary absence, found no one she knew, disappeared and was never seen again. Though this Mungoose was always at liberty and was often in the company of wild Mungooses she never showed any signs of breeding."

"Bangalore, March 8th, 1891."

Mr. R. E. Holding exhibited and made remarks on some specimens of the horns of Rams of various breeds of the domestic Sheep (*Ovis aries*).

Messrs. Beddard and Murie exhibited some drawings and specimens illustrative of the cause of death of an African Rhinoceros (*R. bicornis*), and made the following remarks:—

"The Society purchased from Mr. Carl Hagenbeck, of Hamburg, in September 1868, a young male African Rhinoceros (*R. bicornis*), which had been captured in the neighbourhood of Cassala, Upper Nubia. The animal in question has been figured in the 'Proceedings,' 1868, pl. 41, and again in Dr. Sclater's memoir 'On the Rhinoceroses now or lately living in the Society's Menagerie' ('Transactions,' vol. ix. pl. 99). The relative differences in the size of the anterior and posterior horns according to age are therein shown, and may be instructively compared with their different proportions in the more aged animal, as illustrated in the outline diagram taken after its death, and where the posterior horn is the largest. Whether, therefore, the so-called *R. keitloa* may eventually turn out to be only a variety due to age and other circumstances remains a doubtful and open question.

"Our young *R. bicornis* when received was supposed to be about 2 years old. As it lived in the Gardens close upon 22 years, its age may be roughly reckoned at 24 or 25 years. When a denizen of the Menagerie it fed well and throve amazingly, latterly reaching a gigantic size.

"For a long time this African Rhinoceros exhibited every appearance of perfect health and activity. But a few years back there annually appeared what may be regarded as an eruption of the skin, in the form of slight roughened elevations, which became abraded with an ulcerous aspect. These, however, passed away without leaving any bad effects. The sores on the legs were regularly washed with a syringe of tepid water containing a little carbolic acid. The most noticeable sores appeared on those parts of the animal which rested on the ground, and might be compared to the bed-sores of bed-ridden human beings.

"About a twelvemonth ago its Keeper began to observe that it declined in flesh, though its appetite still continued fairly good. Within a couple of months ago more prominent symptoms of wasting appeared. But even quite towards the last, it still took its food, though seemingly a trifle more dainty in its appetite. Without any other striking feature of illness, it died on Sunday, the 12th April.

"On a *post-mortem* examination of the body the next day, the flesh generally was seen to be soft, flabby, and anæmic. For such a huge body it was decidedly lean and impoverished, and the fatty tissue not only meagre in quantity, but everywhere reduced to a watery condition. In other words, the carcass bore evidence of a gradual wasting or debility having occurred.

"In the stomach there was a considerable amount of food—viz., chopped hay, straw, carrots, and other vegetable substances; and along the intestinal tract, especially the colon and cæcum, much pultaceous material in various stages of digestion. Altogether most of the visceral organs and the brain were sound in general aspect, though lax in consistence—the liver, for example, which was very friable.

"The anterior moiety of the palate, though, was apparently in a state of degeneration. The fore pad particularly was considerably absorbed and the surface raw and ulcerous-looking. Other parts of the mouth and fauces were healthier, but lined with a superabundance of glutinous mucous deposit and exudation. The œsophagus, however, was not affected.

"About the middle of the stomach towards the great curvature there was a triangular elevated patch, about 3 inches long by $2\frac{1}{2}$ inches wide at its broadest part. This cancerous tumour was situated on the top of the elongate mucous ridges; its more pointed part directed towards the pyloric end of the organ. Its higher wedge-shaped, flattish, abraded surface was of a brownish-yellow tint, intermingled with vascular punctations. This was surrounded by paler-coloured, roughened, nodular excrescences, radiating therefrom and filling the depressions alongside the mucous ridges.

"The tumour was firm and solid in consistence and the subjacent submucous and muscular tissues thickened, condensed, and of a glistening texture when cut into. Excepting pallor of the surrounding mucous membrane, and the tumour in question, the stomach otherwise was not diseased.

"The said tumour bore a strong resemblance to, and doubtless, as microscopic examination showed, was the same as, a cancer of the human stomach.

"The more immediate cause of death however, may be attributed to endocarditis, the right ventricular cavity being affected. Both on its septal and opposite peripheral wall were layers of soft lymphy exudation. These even extended as rough, flocculent masses upon the fleshy columns and tendinous cords. There was no deposit in the other cavities of the heart or large arteries. Under the microscope the cardiac exudation proved not to be cancerous in nature.

"Judging from the pathological conditions met with, the course of the animal's illness is pretty evident. Whatsoever may have originated the cancer is obscure; but, once set up, the only positive symptom of serious ailment was the gradual emaciation of the body, in spite of a goodly consumption of food. With defective nutrition and the wasting of tissues arose the tendency to blood impoverishment, resulting in the diseased condition of the heart, which was quickly fatal.

"Cancer of the stomach in Solipeds and Ruminants is rare, though occasional instances are recorded in veterinary publications. Its occurrence in the Rhinoceros, therefore, is a noteworthy fact, as taken in connection with its belonging to the Perissodactyla—a limited living group, whereof the Horse tribe represent the domesticated and the Tapir and Rhinoceros the wild examples."

Mr. E. T. Newton read a paper on a Skull of *Trogontherium* *cuvieri* from the Forest-bed of East Runton, near Cromer, of which the following is an abstract:—

In the year 1846 Sir Richard Owen referred certain Beaver-like jaws and teeth from the Cromer Forest-bed to the *Trogontherium cuvieri* of Fischer, and although some doubt was thrown upon this reference he maintained the correctness of his determination in 1869, when describing some further remains of this rodent. The type of Fischer's *Trogontherium* being a skull, it was very desirable that a similar specimen should be found in the Forest-bed, which could be compared with it; but hitherto the only parts of skulls which have come to hand have been mere fragments. Recently, however, Mr. A. Savin, of Cromer, has obtained a nearly perfect skull from East Runton, and it is this which is fully described in the present communication. A comparison with the skull of a Beaver (*Castor*) shows that although in a general way resembling it, yet the differences are certainly of generic importance. One of the chief points of difference is found in the structure of the cheek-teeth; for while in the Beaver the enamel-folds are open to the exterior of the teeth down to their bases, in the *Trogontherium* they are open for only a short distance from the summit, and consequently with wear they are soon separated from the exterior and form islands of enamel, some of which may become obliterated at a comparatively early stage. It follows from this that well-worn teeth may have fewer enamel-folds than others in an earlier stage of wearing, a fact which has led to errors in the determination of the affinities of this fossil rodent.

When compared with the type skull of *Trogontherium*, this Forest-bed specimen is found to agree so closely with it in form and structure, as well as in the arrangement of the enamel-folds of the teeth, as to leave little doubt as to their specific identity. And a further comparison with the *Conodontes boisvillettii* of Laugel, from the Pliocene of Saint Prest, reveals no difference of specific value. The study of this new specimen from the Cromer Forest-bed thus confirms Sir Richard Owen's reference of these English and French rodents to the *Trogontherium cuvieri* of Fischer.

This memoir will be published entire in the Society's 'Transactions.'

The following papers were read:—

West, Newman
Horace Knight } chr. lith.

New Asiatic Butterflies.

1. On Butterflies collected by Mr. W. Doherty in the Naga and Karen Hills and in Perak.—Part I. By H. J. Elwes.

[Received April 1, 1891.]

(Plate XXVII.)

In the following notes I have given a list of the rarer and more interesting Butterflies collected in the years 1889 and 1890 by Mr. Doherty; but I have not thought it necessary to mention the commoner ones which have already been recorded from the neighbouring regions, as it is obvious that no list can be anything like complete unless based on collections made during a much longer time than Mr. Doherty has been able to devote to one locality.

The principal places he visited were as follows:—During March and April 1889 he was at Margharita, which is near the coal-mines S.E. of Sadya in Upper Assam, and this locality, owing to the very cold, rainy, and unfavourable weather, was very unproductive. Some of the more interesting species occurring here have been already described by him in the 'Journal of the Asiatic Society of Bengal,' 1889, p. 125. It appears that there is here among the insects, as amongst the birds, a general prevalence of the common Indo-Malay species which are found all along the sub-Himalayan forest and throughout the low country of Assam and N.E. Bengal, with a slight admixture of forms peculiar to Upper Assam, and having more relationship to species found in China and East Tibet than to Indian species.

Writing from Margharita, Upper Assam, on May 6th, 1889, Mr. Doherty says:—"I had to go to Darjiling for my Lepchas and got two fairly good men; I have also two other men, one of whom is quite as good as the Lepchas, and hope by high wages and continual presents to keep them permanently in my service. I have had no success as yet. I reached here April 23rd. As this is probably the best collecting-ground in the Assam valley, and as both my expeditions have failed, and I will never make a third, I will give you some notion of the seasons, so that you may secure better success to anyone who comes later. Last year the rains continued down to the cold weather, November 1st, after which Butterflies disappeared entirely, though Moths flew till December 1st. During October very few species were flying, though some were fairly abundant, including four species of red *Charaxes*, and even *Rhinopalpa fulva*. There were scarcely any Lycænidæ or Hesperidæ. The forest-paths were all flooded and impassable till the cold weather had well begun. So the autumn is quite hopeless for collecting. This spring I learn to my surprise that a host of Butterflies came out about March 15th, in spite of the cold and violent winds, disappearing during the first week of April. The Chota barsat (little-rains) began in the last days of March. April was exceedingly wet and cold. We were wearing heavy ulsters and double flannels in the steamer from

Tezpur upwards. The rain still continues, the country is flooded, and the nights are so cold that few Moths are flying. Everyone says that in June the second brood of Butterflies comes out in full force in spite of the rains, but then hill expeditions (and Margharita is quite among the hills) are out of the question. I cannot stay here till then, as the road to Kohima, in the Naga Hills, will be closed, except for coolies, by June 1st, and I have better hopes of success there. Nevertheless I am getting a few new and good things, such as *Apatura ulupi, Pithecops fulgens, Calliana pieridoides,* and *Limenitis austenia* ♀, *Papilio elephenor* and *P. telearchus.*"

The rainy season of 1889 was spent by Mr. Doherty in the Naga Hills, which had previously been almost unexplored by entomologists, though a considerable number of Butterflies were collected on their lower slopes by Messrs. Peal and Sherwill and a small collection was made by Dr. Watt on his march from Manipur through the Naga Hills to Assam in 1883 or 1884, and described by Mr. Butler in the 'Annals & Mag. of Nat. Hist.' for 1885.

After leaving Margharita, where the rain continued till the end of May, Mr. Doherty went up to the Naga Hills, marching *viâ* Dinapur. He writes of the route from Nichugard, Naga Hills, on June 10th, as follows:—

"The Dhansiri valley is a perfectly flat jungly country 300–500 feet above the sea and wholly uninhabited. We moved on very slowly. I hired coolies to push the carts through the mud, and they as well as my men and myself were at work all day long on them; but all the same we made less than a mile an hour, the distance being 83 miles. It is still 36 to Kohima." Mr. C. B. Clarke has described this road, which is the only approach to the Naga Hills from Assam at present, as being in the rainy season a sea of mud, lined with the carcasses of cart-bullocks which have succumbed on the journey, and almost impassable.

"Whenever the rain stopped we caught Butterflies and Cicindelidæ. There are no jungle species, the road being bordered by 40 feet of high grass. Still there are a few good Butterflies, *Papilio elephenor* and *P. sakontala* [The last I did not receive.—H. J. E.], and *Libythea rohini* (*L. narina*, Godt.), but only a few very common Lycænidæ, Pieridæ, and Hesperidæ. I am now at Nichugard, at the mouth of the gorge of the Dhansiri river, and am glad to have a quiet day after so much rough work. It is a great disappointment to find that there are now no Moths here. As to Butterflies, I have not yet found out whether there are any; but if there are collecting will be delightful, as the country is divine, the jungle-paths excellent, and we have several hours of sunshine every day, though it rains every morning till ten. It will give you some idea of the cost of travelling here when I say that I am obliged to pay 4 rupees a maund (say 8 per cwt.) for getting my luggage carried from here to Kohima, 36 miles. Yet at Kohima I am only at the beginning of my expedition, and I have 16 maunds of luggage besides provisions."

The physical features and peculiarities of the Naga Hills have been so well described from a botanical point of view by Mr. C. B. Clarke, F.R.S., in the 'Journal of the Linnean Society, Botany,' vol. xxii. 1886, p. 128, that I need not say much about them here; but I extract from Mr. Doherty's letters some details of interest. He says, writing from Mao, Manipur, on September 9th, 1889:—

"I have not marked the altitudes exactly, as we ascend 2000 feet nearly every day, and I know the exact elevation only of those I catch myself. *Euplœa midamus* ranges up to 6500 feet and is the only *Euplœa* found above 4000 feet. *Limenitis austenia* is confined to the low country. *L. dudu* is rather common, much more so than *zuleima*; these species approximate to *Parthenos* (*austenia* is almost a *Parthenos* in structure) and are easy to catch. The numerous Celebesian species belong to that part of the genus nearest *Athyma*, *Moduza*, and *Pandita*, and are hard to catch: one characteristic of what I call the Nymphalidæ (*i. e.* the *Neptis-Euthalia-Limenitis* group) is the entire absence of true genera; the structure is plastic, and one type melts insensibly into another. Besides *Euthalia nara* I send a female near it, but perhaps different (*E. anyte* ♀), and also what seems a new species, a local form of *E. anyte*, apparently quite distinct. *Libythea rohini* occurs only below 3000 feet. Nearly all the Darjiling Erycinidæ have turned up here, as well as several specimens of my hitherto unique *Everes kala*, which is distinct from the Tenasserim species, *E. umbriel*, Doh. I also send *Everes nyseus* and *parrhasius*. Here the latter has the tails rudimentary or absent. Among *Ilerdæ* I send *I. epicles*, which occurs from the plains to 6000 feet, *androcles* from 6000–9000 feet, *brahma* 4500–5500 feet, *tamu* 4500–8500 feet. *I. androcles* is variable, the green hind wing almost disappears in some, and when flying they have the air of obscure black Butterflies. I send a large set of *Dercas wallichii*, which is curiously like *Gonepteryx zaneeka* of the North-west. It flew in June and disappeared in July. *Leptocircus* is very common in Assam, ranging up to 6000 feet [I found it in the Khasias only at low elevations in very hot dense forests.—H. J. E.]. I took it on the Dibong north of Sadiya, probably the northern limit of the genus.

"Of *Teinopalpus* I send a broken male; your account of its habits agrees exactly with what I have seen of it up here. I send a battered specimen of *Papilio krishna*, so all the four species of green *Papilios* (*krishna*, *paris*, *ganeesa*, and *arcturus*) are found here, but are provokingly rare. *P. evan* occurs at Margharita, but I have seen none here, though *P. gyas* is not uncommon. I send a fine female of *P. rhetenor*, also a single female of *Aulocera loha*, from an elevation of 5500 feet in Northern Manipur.

"The *Armandias* sent seem to be slightly different from the Bhutan form. [The only difference I see is that they average smaller.—H. J. E.] It first turned up about August 10th, in the beautiful uninhabited Zulla valley, the border country between the Angami tribe and the Kachla Nagas, 10 to 15 miles from Kenoma, in the direction of Khonoma. It generally kept to the ridges, occasionally descending into the valley, once almost down to 5000 feet. Afterwards I found it on the western side of Japoo, at 7000–8000 feet, and between these two places we got one or two every day. At Mao, in Manipur, I have taken worn specimens at 7500–9000 feet. My Lepchas, who collected at Buxa, in Bhutan, say there is no chance of another brood. Strange to say, I have never seen a female. The Butterfly drifts about among the tree-tops, rarely descending to the ground; the crimson of the hind wings is not so conspicuous as one might think, and if one loses sight of it for an instant it is very hard to make out again, its transparent dark grey wings being hardly distinguishable among the shadows, and it is blown about by the wind, more like a dead leaf than a living insect. Its flight is much like that of *Hestia*, but less buoyant and circling, as might be expected from its angular wings; nevertheless its resemblance strikes one. Seen from above it must be much more conspicuous, and is no doubt a protected insect; at the same time its weak flight may even add to its chance of escape, as it certainly does with *Hestia*, for it is impossible to calculate the direction in which it is making. The whole body and wings give out a delicious odour, which remains for some days after death. In some positions and at some distance *Armandia* looks like *Danais tytia*, which is very common in the same places. *Armandia* hovers about flowers, like other *Papilios*. During rain it alights on a leaf, and droops its fore wings over the hind ones, thus covering the bright colours. Several were taken in this way; but I confess I only caught one myself, as I have not the patience to do as my men do, and watch one of these lovely things for hours and follow it over these steep jungly hills, on the very small chance of catching it finally. Falls, leeches, and torn clothes are the only things you can count on, but there is a fair chance of a fall into a tiger-pit. I came very near staying permanently on Kohoni, having fallen into one of these pits yesterday whilst chasing an *Armandia*. I can usually detect one of these pits by the broken twig that marks it, but this was an old one overgrown with weeds and away from any path. It was like a cistern, 12 feet deep, roofed over with logs, leaving but a small opening, so that if a deer or pig is caught and the tiger is hungry, he jumps in and cannot get out. I thought I was gone, for there was no chance of being found there, and it seemed quite impossible to get out. It took me 8 hours hard work to do it. I made steps up the side with my knife, and contrived to hang somehow at the top beneath the roof. After trying three sides I saw a small stout stick six feet from the opening, and after several hours succeeded in pulling it to me with my broken butterfly-net; then I put it across the opening and with great difficulty swung myself out, and I came home in the dark, very thankful to have escaped. The Nagas are not afraid of these pits, as they go nowhere alone; but they have another sort of trap of which I have a perfect horror, and so have they. It consists of great stones hung from trees, and set free by a vine across the path, crushing any animal which touches it. Each village has its own traps, and every child knows their positions. For fear of these infernal machines, no Naga will venture into the forest land of another village. Nevertheless many deaths are caused by them. I myself saw one only just in time on Japoo, and my Lepchas on account of them, and their lack of enterprise, never wander far. So far every locality in which we have taken any good Butterflies on this expedition has been found by me. My men, even my Maslaman, who is a good jangal-wala, rarely go beyond where I have led them. This very likely explains the comparatively small results achieved by them at Buxa, which seems to be naturally a grand place for insects.

"It is my opinion that there will be no autumn brood of Butterflies in the high country of these hills. As for the lowlands there is some chance of one about October 1st, though none came out last autumn at Sadiya and Margharita. Wood-Mason found August and September best at low elevations in Cachar. Here there was nothing in August below 5000 feet, nothing at all. I think you have an exaggerated view of the 'succession of broods' through the rainy season, or Sikkim at least must be very exceptional in this respect. In Borneo, during my first week there in September, I got about 90 good Butterflies a day, in most monotonous virgin forest without paths. In January here, except two or three common *Junonias*, and a few truly continuous species like *Ypthimas* and *Ragadia crisia*, perhaps ten in all, I did not see more than three Butterflies a day on an average, compared with about 500 in my first week.

"Hitherto I have found here only the seven Sikkim species of *Cyaniris* (of which *puspa* was taken at low elevations only, the other six only at high ones) and an additional one *chennelli*, of which I send the undescribed female. I had hoped to get a much larger number, because in Java of eight species examined only three (namely, *puspa, placida,* and *dilectus*) were Indian."

Writing from Nichugard, on his return there on November 2nd, Mr. Doherty says:—

"I sent two men to the low country after the middle of September, but they scarcely caught anything.

"It rained furiously, and now I feel sure that there is never an autumn brood in these hills either in high or low country. Possibly on their southern face at Manipur it may be otherwise, as it is at Cherra-punji and apparently in North Cachar. My trip up Japoo towards the end of September did not result in much. I got a number of *Armandias,* several of them in good condition, so, strange as it seems, there must be an autumn brood after all. At the extreme summit, 9895 feet, I got *Everes kala* and a worn *Zephyrus.* At night I got a number of Geometridæ, mostly small, in my camp at 8000 feet. This shows the lateness of the season, as they are always the last [? first.—H. J. E.] Moths out. As the weather was warm and wet, I expected a great variety of Moths, especially as I had failed there in July, and as I had done so well at Margharita last year up to December 7th, though it was very cold and dry all through November.

"Throughout the rains my baits failed, and I prematurely concluded that the Moths of temperate climates did not care for them. However, after a number of experiments I began to succeed, and am doing very well now, so I wish I had persevered longer on Japoo in July.

"One great drawback was the nervousness brought on by over-much climbing. Every night I went out with baits I never slept a wink, and my men were afraid of tigers and Nagas, and scamped their work unless I was with them. I had previously thought that Bombyces never came to baits, except *Syntomis*, and a few Agaristidæ and Arctiidæ, any more than the Tineidæ do. Now I think that nearly all Moths (*Macros*) will occasionally come to good baits well placed, except perhaps Saturniidæ, which apparently never feed.

"Sweet baits I find best for Noctuas and nasty ones for Geometers and Pyrales. The greatest difficulty is that the best baits will only attract Moths from a short distance, not like lights, and consequently to obtain good species one must put them in virgin forest, so that the fatigue and worry is enormous.

"On the other hand, I have concluded that lights are a failure. Taken into the jungle my big lamps simply frighten away Moths, and even in a white tent they only attract a few little Noctuæ. I am inclined to think that Moths have to be gradually accustomed to lights. In a large station they get used to coming to lighted houses, especially those that are lighted every night. At Kohima the dak bungalow is far better situated for Moths than any other house, and my lamps were the best in the station, but I always had to go to other peoples' houses for Moths. In coffee-plantations the Moths would keep beating agaist the windows of the bungalow, though there might be only a candle or two inside, while my tent in the jungle close by, lit with a good lamp, attracted not a single insect."

These notes will be very interesting and useful to collectors, but the Moths collected in the Naga Hills are far too numerous to be described in this paper, although I hope to deal with them as soon as possible. After leaving the Naga Hills Mr. Doherty spent six weeks in Calcutta and Darjiling and then proceeded to Perak, where he stayed but a short time. As this locality is well known and I have mentioned the most interesting of his captures in their order, I need say nothing more. After leaving Perak he went to Rangoon and started on an expedition to the Karen Hills, where he remained for some weeks at Peti-chaung, and wrote to me as follows on April 16th:—

"I have been collecting since March 17th in the Karen Hills east of Toungoo. I see Mr. Grose Smith has described some Karen species sent him by Mr. Noble, who does not know exactly where they came from. I think it was from Kaserdo or Kacherdo, called by the Burmese Taung-gyi, 'the big hill'; an isolated hill 1500 feet high 10 miles east of Toungoo, and quite in the plain of Pegu. My collection is from several places 30 or 40 miles east of Toungoo. I would label everything simply 'East Pegu' with the elevation, as the term Karen Hills is misleading. My high-country specimens are chiefly from Thandaung and the neighbouring hills, from 4000 to 5000 feet. The low-country ones chiefly from Peti-chaung 500 to 2000 feet. I have made only this division, as between 2000 and 4000 feet I got only a dozen or so species, chiefly Ypthimas. The high-country Butterflies were nearly all of the Khasia species; the low country contained some interesting Tenasserim and Malayan forms. We have had to work very hard to secure this small result. Until the last day or two it was the dry-season brood we caught, but most of the Papilios have been flying all the winter, and the *Stictophthalma louisa* only came out a week ago along with *Neope bhima* and a few others in the low country only. On the mountains I doubt if the wet-season brood comes out before the middle of May; we got everything there was out up there. At Thandaung there are four peaks. I lived on one, the others were four miles away forming a triangle a mile apart. Each of my men used to take a peak and stay there all day, and Pambu actually made a platform of boughs on the top of a tree and stood on it all day long like an orang-utan, but we did not any of us catch much. I do not think we averaged till quite lately above twelve specimens per day each, and many of these were useless.

"There is no virgin forest anywhere on the hills, though about here it is very fine. The Karens, though a civilized and intelligent people (all Baptists west of Thandaung, though the Red Karens are heathen still), still keep up their bad old habit of 'juming.' This is the system of cultivation practised by nearly all the hill men of Indo-Chinese race, and consists in cutting, burning, cultivating, and abandoning fresh tracts of forest every two or three years, so the whole country is a desert of scrub and bamboo. I spent two days going to Lepya gyi, and again up the hill north of Thandaung, about 5000 feet I think, but got nothing, though the Thandaung jungle, bad as it looks, is, I imagine, as good as any west of the Salwin river. Thandaung used to be a sanatorium, but was abandoned on account of fever and a certain terrible fly that infests it. Tigers are very abundant, and there is tigers' dung all along the road, on which all my *Euthalia taooana* were taken. I imagine that this country from Tenasserim to the Lushai Hills will be the great tiger preserve of the future, as except on the plains it is too barren ever to support many people. I must explain that I sent a great many bad specimens, as I thought there were enough to make an article about, and I think, altogether, of 300 species good and bad. In the Danaidæ I got nothing at all uncommon. *Esites angularis* occurred in the low country along with a rare new species, of which the hind wing is produced more at the middle than at the upper median vein. Of *Zethera diademoides* only males, which were numerous at 1000 to 2000 feet. I see Mr. Holland makes a new genus of it, *Euplœmima*; but why not call it *Anadebis*?

"I send a few of both sexes of a *Thaumantis* near *aliris* (*pseudaliris*, Butl.). Like the other two species, it mimics when flying a large protected Cicada (*Posena melanoptera*?). It swarms in Borneo, where I have often mistaken the butterfly for the cicada, and *vice versâ*, though after death the cicada faded, so that the resemblance is hard to see. I also send *Zeuxidia masoni*; the fragrance of the male is peculiar but very sweet. I have been unlucky with *Cyrestis nivalis*, of which I have seen half a dozen. From its extreme timidity I think one can see that it is at the limit of its range, and just maintains itself. In the Apaturidæ I got very little of interest. The *Stibochiona* seems new. It was very rare and confined to the summit at from 4000 to 4500 feet. If you describe it please mention the hairy eyes of this genus; this is its most remarkable feature and not mentioned by Westwood.

"A fine pair of *Prothoë caledonia* are perhaps the best things I got, no others were seen, but *Prothoë angelica* was more common and was taken on the body of a dead Python. It is very fragrant in both sexes. There are several *Charaxes* of the *polyxena* group, the names of which I do not pretend to know; also *C. durnfordi*, of which I am very proud; it is very hard to catch, even more difficult than *Prothoë caledonia*. I have noticed enough facts to be confident that timidity is a source of protection. In the Eastern Ghats, where *Neptis nandina* is rare, I could always tell it from *N. varmona* a hundred yards off, because it flew away; but then *varmona* is like *hordonia*, a protected species. All the *Charaxes* in the Malayan region are hard to catch, as poor Kunstler used to insist; but there is nothing more helpless than most *Charaxes* in the Indo-Burmese region. They fly so straight that you can take them on the wing nine times out of ten; they persistently return to the same spot and love to light on projecting twigs, where you can easily get them by a stroke of the net from below. But that is not the case in the Malayan regions; I do not know how many hours I spent in the interior of Sumba trying to catch a huge undescribed *Charaxes* of the *pyrrhus* group; and the *polyxena* group never seem common down there as in India.

"I send many males of *Neurosigma doubledayi*. It seems to me distinct from the Sikkim form, of which I took dozens in the Chittagong hill-tracts, all black and fulvous above. All the Athymas sent are from the high country above 4000 feet. I do not know why."

Mr. Doherty then gives a lot of notes about various Lycænidæ, which will be inserted in their places, and shortly afterwards left for the Ruby-Mine district north of Mandalay, whence he wrote from the Injok valley near Bernardmyo, on May 25th, as follows:—

"I have been at Bernardmyo at 5400 feet, and here in a hut at Injok since May 2nd; we had rather an absurd journey. At Thabeit kyin on the Irawadi river the country was wholly parched up, not a green leaf for miles, and the grass on fire everywhere. From there the road goes to Mogouk nearly 70 miles. Transport had broken down, but I managed to borrow two carts, for two of my Lepchas were sick and could not walk, and hired two pair of bullocks at 35 rupees each. They broke down at a desolate place 12 miles out, where I had to stay two days. Then, luckily for me, General

Wolseley came along and got me bullocks, and we went on together for a stage. Then my drivers ran away, and my cook and I had to drive the carts ourselves, and as I have no gift at all for bullock-driving it took us eight days to reach Mogouk. There were no insects all the way but a few dry-country species such as *Antigonus*, and one or two *Neope bhima* at 2000 to 3000 feet. Mogouk is a lovely place, but no Butterflies, so I came to Bernardmyo and found it just as bad. No Lepidoptera or shells. The few Butterflies taken (*Zophoessa sura* and *yama* quite common) were all Naga-Hill species except a curious *Cellerebia* (?) with a sex-mark as in *Ypthima* (*Y. narasingha*), which is very scarce. No sign of any *Chrysophanus*. No *Ilerda* but *brahma*. Bernardmyo is a dreary place in the midst of a vast fern-pasture, stuck all over with charred stumps; for all this country was high forest twenty years ago, and there were no natural meadows, and no flowers, only grass and fern.

"The high peak here is 7500 feet, and there are two others nearly as high. The nearest bit of forest is four miles from Bernardmyo, and nearly all above 6000 feet, so that collecting is weary work. I thought that I had come just at the right time, for the grass-burning was over, the grass just springing, and the first showers had fallen. We had two weeks of bright weather, but since then it rains every day from 9 to 3, clears off at 5, and the nights are clear, cold, and windy, bad for Moths. For the last ten days I have been doing well in beetles, but there are no flower-haunting species like Cetonias. The Moths are just beginning to come out, but there are no Butterflies nor any hope of them.

"The forest is singularly fine, full of tree-ferns, better than anything in the Naga Hills, and the trees are nothing like so much buried in moss and orchids; so the climate must be much drier than that of Kohima, though the rainfall, 70 inches (at Mogouk 110), is nearly as large. To-morrow I leave for the low country in the Shan State of Momeit; I hope I may come back alive, for the authorities have solemnly warned me against going. All my men have been almost constantly sick, and Longchung has quite broken down, so I leave him here. I have not been very strong myself, so I hope the long voyage to Sumatra will set me up again. This is a desperately expensive country: fowls are 2 to 4 rupees each, and coolies get $1\frac{1}{2}$ rupees a day each. At Bernardmyo I luxuriate on commissariat bread and beef, and every one both civil and military has been very kind.

"You ask me about the *Himantopterus dohertyi* which you described in the Trans. Ent. Soc. The first specimen with the tails quite filiform (♀) I caught crawling out of an ant's nest in the ground. I dug the nest open, but did not find any more. The others were all I think taken flying in broad daylight along the road from Kohima to Kegwema at 5000 to 6000 feet, usually in the morning. They flew heavily and slowly; I noticed a slight offensive smell, much as in *Histia flabellicornis*. With regard to that superb *Campylotes* (*C. desgodinsi*, var. *splendida*, Elwes), I hardly ever saw such a conspicuous insect; it shone in the jungle like a little fire. I got it in the

Zulla valley along with *Armandia*; the other species (*C. histrionicus*, var. *altissima*, Elwes) came, I think, from lower ground. The mimicry in this species seems very perfect at a little distance, both in flight and colouring; so that it is only when you look closely that you see that all the colours are quite different from those of *Danais genutia*. The long-bodied Sphinx-like *Bombyx* you think a new genus (allied to *Tarsolepis fulgurifera*, Wk.) was taken in cracks and hollows of trees high above the ground, and was hard to distinguish from the bark. The creatures can hardly fly at all, and I brought down one with a stone."

I may add that the species just referred to came from the Naga Hills, not from Burmah.

On his return from Momeit, which I see is also written Momeik, and is now to be annexed to British Burmah, Mr. Doherty writes me from Mandalay on June 30th:—"Among the Momeit Butterflies are a number of *Libythea rohina* (*L. narina*), which occurs there along with *myrrha*. Also a few pairs of *Yoma vasuki*, Doherty. I think *Yoma* will stand as a genus in spite of Semper's rash identification of it with *Salamis*. Each of the islands from Java and Celebes eastwards seems to have its form of *Yoma*, all very dubiously distinct; though constant enough on the upperside, *vasuki* is no better species than two or three more. Among the Bernardmyo species is a broken specimen of *Papilio machaon* taken at 5500 feet. The soldiers there took several broken examples of *P. gyas* and *P. krishna*, also a bad specimen of *Lethe purana*, none of which I got. The weather at Bernardmyo was much colder than I expected, colder than Darjiling in the rains. During June the weather was lovely, and I do not understand why the woods were so devoid of all animal life. May was a good month for beetles and I did very well; but June was a failure all round, both on the high and low country. I was detained beyond my intentions, as Longchung was too ill to be moved, and then I could get no transport. At last I got away in the 'burst of the monsoon' and had a most uncomfortable 70 miles to the river. Thabeitkyin, where scarcely any rain falls, was like a paradise when we got there, and I was able to dry all my specimens, which I hope will reach you in good order. My men are all very low with fever and dysentery. The Ruby Mines are the most unhealthy district I ever heard of; I suffered far less than my men, and yet I lost 15 pounds weight."

The extracts which I have quoted above give a graphic picture of the life of a collector in the more unexplored and out-of-the-way hill-tracts of India; and though Mr. Doherty constantly speaks, as Wallace does in the Malay Archipelago, of his want of success, yet he has done more than I could have expected in the time, and his collection of Moths in particular, though not so numerous in Burmah as in the Naga Hills, includes many novelties, and will take me some time to work out. After leaving Burmah Mr. Doherty went to Sumatra, and is now on his way to the Eastern islands of the Malay Archipelago, whence I trust he will return in safety with rich collections. He has already done more than any other single man I know of, not only in collecting, but in studying the materials he obtains.

For further particulars as to the physical features, climate, and natural productions of the Karen and Shan Hills, I may refer to Capt. Wardlaw Ramsay's paper on the Birds of Karen-nee in 'The Ibis,' 1875, p. 348; to Mr. Hemsley's paper on the Botany of Upper Burmah and the Shan States, in the 'Journal of the Linnean Society,' vol. xxviii. 1890, p. 1 *et seq.*; and to Dr. Manders's list of the Butterflies collected by him in the Shan States, in the 'Transactions of the Entomological Society,' 1890, which will supplement my paper.

Subfamily SATYRINÆ.

ZETHERA DIADEMOIDES.

Z. diademoides, Moore, P. Z. S. 1878, p. 824, t. 51. 3; Butt. Ind. i. p. 98, t. xiv. 33 ♂.[1]

Abundant at lower levels in East Pegu, and does not vary perceptibly.

CŒLITES NOTHIS.

C. nothis, Doubl. & Hew. Gen. D. L. p. 368, t. 66. 2 (1851); Butt. Ind. i. p. 101.

Not found by Doherty, but occurs at Bhamo. Major Adamson took it in dense forest.

CŒLITES EPIMINTHIA.

C. epiminthia, Westw. Gen. D. L. p. 368 (1851); Butt. Ind. i. p. 101, t. xiii. fig. 31.

Perfectly distinct from the last, and not uncommon at Perak.

CŒLITES EUPTYCHIOIDES.

Cœlites euptychioides, Feld. Reise Nov. iii. p. 499.
Cœlites humilis, Butl. Ann. Nat. Hist. ser. 3, xx. p. 403 (1867).
Cœlites euptychioides, var. *humilis*, Dist. Rhop. Mal. p. 45, fig. 15.

A pair of this fine species from Perak.

MYCALESIS ANAXIAS.

M. anaxias, Hew. Ex. Butt. iii. *Myc.* t. 4. 25, 26 (1862); Butt. Ind. i. p. 106.

Occurs with the next at low levels in East Pegu.

MYCALESIS ANAXIOIDES.

M. anaxioides, Marsh. Butt. Ind. i. p. 107.

Two pairs from East Pegu at 1500 feet agree perfectly with the description and in the points of difference mentioned by Marshall; they are also larger than any specimens of *M. anaxias* I have seen.

[1] I have cited Marshall and Nicéville's 'Butterflies of India' throughout this paper simply as "Butt. Ind."

MYCALESIS SANATANA.

M. sanatana, Moore, Cat. E. I. C. i. p. 231; Butt. Ind. i. p. 108.

Common in East Pegu in March and April at 4000 to 5000 feet.

MYCALESIS GOPA.

M. gopa, Feld. Nov. iii. p. 501; Butt. Ind. i. p. 107.

A specimen from the Naga Hills taken in August together with specimens of *M. perdicias*, Hew., from Hongkong and Ichang in China, tend to confirm the opinion I have previously expressed, that these forms are inseparable.

MYCALESIS GOTAMA.

M. gotama, Moore, Cat. E. I. C. i. p. 232 (1857).
M. charaka, Moore, P. Z. S. 1874, p. 566; Butt. Ind. i. p. 109.
Sadarga oculata, Moore, Trans. Ent. Soc. 1880, p. 158.
M. oculata, Butt. Ind. i. p. 109.

A specimen of the so-called *M. charaka* from Margharita taken by Doherty in May, and one from Bhamo obtained by Major Adamson, are inseparable from *M. gotama*, which also occurs in the Loochoo Islands (Pryer) and at Kiukiang (Pratt).

MYCALESIS MALSARIDA.

M. malsarida, Butl. Cat. Satyr. p. 134, t. 3. 14 (1868); Butt. Ind. i. p. 127.

M. khasiana, Moore, P. Z. S. 1874, p. 566; de Nicév. J. A. S. B. vol. lvii. pt. ii. p. 273 (1889); Butt. Ind. i. p. 127.

The wet-season form of this butterfly was taken in May by Doherty at Margharita.

MYCALESIS NICOTIA.

M. nicotia, Hew. Gen. D. L. p. 394, t. 67. fig. 4 (1851); Butt. Ind. i. p. 129.

Males of this species were common in East Pegu at 4000 to 5000 feet in March and April, and differ from those taken at the same season in Sikkim in the ground-colour of the underside, which is much paler. A female from the Naga Hills at about 6000 feet, taken in August, is of the rainy-season form, and agrees with others from Bhutan and Sikkim taken in June and August.

MYCALESIS MALSARA.

M. malsara, Moore, Cat. E. I. C. i. p. 231; Butt. Ind. i. p. 129.
Samanta rudis, Moore, Trans. Ent. Soc. 1880, p. 166.
Mycalesis rudis, Butt. Ind. i. p. 130.

Common in March and April in the Karen Hills.

The ocelli and breadth of the white band below are very variable, but all are nearer to the form *rudis* than to the rainy-season form *malsara*, whilst one sent by Major Bingham from the Karen Hills in February is a perfect *rudis*. I think there can be no question of the seasonal dimorphism in this species.

MYCALESIS SURKHA.

M. surkha, Marsh. J. A. S. B. vol. li. pt. ii. p. 37, t. iv. fig. 1 ♂ (1882); Butt. Ind. i. p. 133.

Var. *ustulata*.

M. ustulata, Dist. Entomologist, vol. xviii. p. 289 (1885); Rhop. Mal. p. 418, t. xli. fig. 16 ♂.

With the exception of the larger ocelli, broader transverse lilac band, and more distinct markings of the underside, in which, as Distant says, it forms a transition to the Javan *M. oroates*, Hew., I see nothing to distinguish *M. ustulata*, of which I have two pairs taken by Doherty at Perak in February, from *surkha*, which I have from Tavoy. The difference is just that which might be expected to be produced by a damper and hotter climate, and I have little doubt that both forms will be found at different seasons in the same locality, if the dry and wet seasons are well marked.

MYCALESIS FUSCUM.

Dasyomma fuscum, Feld. Wien. ent. Mon. iv. p. 401 (1860).

Mycalesis diniche, Hew. Ex. Butt. iii. *Myc.* t. iv. fig. 23 (1862).

Mycalesis fusca, Dist. Rhop. Mal. p. 53, t. v. fig. 1 ♀.

Taken at Perak by Doherty, and also common in the island of Nias off the coast of Sumatra (Mogdiliani).

MYCALESIS DOHERTYI, n. sp. (Plate XXVII. figs. 3 ♂, 4 ♀.)

Mr. Doherty sent a pair from the low country of Perak which seem to me, as to him, to belong to an undescribed species of the same group as the last, in which the base of the costal, median, and submedian veins are much swelled in both sexes, and the male has a tuft of fine silky hairs at the base of the hind wing covering a glandular patch.

♂. Dark hair-brown above, with an ocellus near the apex of fore wing, another larger one below it. The hind wing has three small ocelli above and two larger ones below.

Beneath, the wings are paler brown, with a faint broken pale transverse oblique band near the base, another distinct whitish one across both wings not reaching the inner margin of hind wing. Ocelli as above but more distinct, the upper one on the hind wing larger but not so large as the fourth and fifth, and two additional small ones at anal angle which do not show above.

Below, the band of ocelli is edged on both sides with whitish, and there are two pale marginal zigzag lines of same colour.

The female is like the male but rather larger, paler above, and with rounder wings.

MYCALESIS MAIANEAS.

M. maianeas, Hew. Ex. Butt. iii. *Myc.* t. v. 27, 28 (1864); Butt. Ind. i. p. 108; Dist. Rhop. Mal. p. 48, t. vii. fig. 4 ♀.

A single female of this species from Perak agrees with the plate, except that the dull orange band of the fore wing is much fainter and almost obsolete except near the costa.

MYCALESIS JANARDANA.

M. janardana, Moore, Cat. E. I. C. i. p. 234; Butt. Ind. i. p. 128; Dist. Rhop. Mal. p. 54, t. v. fig. 2.

Martanda janardana, Moore, Trans. Ent. Soc. 1880, p. 169.

Seems fairly common at Perak in January and February. Fresh males show a black velvety sexual patch of scales covering the whole of the centre of the fore wing, which is not mentioned by Moore or Distant. The female is larger and with rounder wings.

I should include this in the same group as *M. fuscum* and *dohertyi* and probably *maianeas*; though Moore says the subcostal tuft of hairs on the hind wing is double, I can see no difference in it.

MYCALESIS MNASICLES.

M. mnasicles, Hew. Ex. Butt. iii. *Myc.* t. v. 32, 33 ♂; Butt. Ind. i. p. 126.

This species, which has hitherto been considered rare, was taken in some numbers by Doherty at the foot of the Karen Hills in East Pegu.

MYCALESIS ANAPITA.

M. anapita, Moore, Cat. E. I. C. i. p. 232; Dist. Rhop. Mal. p. 418, t. xxxix. fig. 8.

Not rare at Perak in January.

LETHE BHAIRAVA.

Debis bhairava, Moore, Cat. E. I. C. i. p. 217 (1857); Butt. Ind. i. p. 139.

Abundant in the Naga Hills at 6000 to 7000 feet and agrees with Sikkim specimens.

LETHE LATIARIS.

Debis latiaris, Hew. Ex. Butt. iii. *Debis*, t. 1. 4 (1862); Butt. Ind. i. p. 140.

Abundant in the Karen Hills at 4000 to 5000 feet.

LETHE SINORIX.

Debis sinorix, Hew. Ex. Butt. iii. *Debis*, t. 3. 19, 20 (1862).

Lethe sinorix, Butt. Ind. i. p. 144.

Occurs in the Naga Hills, and in the Karen Hills at 4000 to 5000 feet.

LETHE KANSA.

Debis kansa, Moore, Cat. E. I. C. i. p. 220 (1857).
Lethe kansa, Butt. Ind. i. p. 145.
Common in the Karen Hills at 3000 to 5000 feet.

LETHE DISTANS.

L. distans, Butl. Trans. Ent. Soc. 1870, p. 488; Lep. Exot. p. 87, t. 33. 4 ♂, 7 ♀; Butt. Ind. i. p. 148.

This occurs not unfrequently in the Karen Hills, but no females were sent by Doherty.

LETHE VINDHYA.

Debis vindhya, Feld. Wien. ent. Mon. iii. p. 402 (1859); Elwes, Trans. Ent. Soc. 1888, p. 313.

Occurs not uncommonly in the Karen Hills at 4000 to 5000 feet, and in the Naga Hills more rarely.

LETHE MEKARA.

Debis mekara, Moore, Cat. E. I. C. i. p. 219.
Lethe mekara, Butt. Ind. i. p. 148.
Occurs in the Karen and Naga Hills at 1500 feet.

LETHE GULNIHAL, var.

Lethe gulnihal, de Nicév. P. Z. S. 1887, p. 450, t. 39. 7 ♂.

A species which agrees nearly with the figure and excellent description of *L. gulnihal* was found not uncommonly by Doherty at from 2000 to 5000 feet in the Karen Hills, and I have also a single specimen taken by Dr. Manders in the Shan Hills. They differ, however, from the type from Bhutan in Moller's collection, now in the possession of Mr. J. H. Leech, in having the narrow lines which cross both wings beneath more zigzag and irregular, and the uppermost ocellus of the hind wing smaller. The female, which is undescribed, is much paler on both surfaces than the male, and has the costa of the fore wing, a spot near the apex, and a faintly marked patch below it of a lighter brownish yellow, with a whitish spot on the first median interspace. The hind margin of the wing not bowed as in the male. The ocelli of the hind wing showing on the upper surface, and the transverse lines of the underside are wider apart and much fainter. The ocelli are also smaller and nearly obsolete on the fore wing.

LETHE, sp. inc.

? *Lethe brisanda*, de Nicév. J. A. S. B. lv. pt. ii. p. 249, t. xi. fig. 13 ♀ (1887).

Two specimens were sent from Konoma in the Naga Hills with note that they belonged to a species different from *L. dinarbas* on account of the prehensores; and though I cannot see enough difference in them to separate them myself, they appear to be as near to *L. brisanda* from Bhutan as to *L. dinarbas*.

The members of this group of the genus are so nearly allied to each other that it is not safe to decide without seeing a series, and I know *L. brisanda* only from the description and plate.

LETHE DINARBAS.

Debis dinarbas, Hew. Ex. Butt. iii. *Debis,* t. iii. 15 ♂; Butt. Ind. i. p. 155.

Common in the Naga Hills at 7000 feet.

LETHE SERBONIS.

Debis serbonis, Hew. Ent. Mo. Mag. xiii. p. 151 (1876); Butt. Ind. i. p. 155.

LETHE MINERVA.

Pap. minerva, Fabr. Syst. Ent. p. 493.

Lethe minerva, Dist. Rhop. Mal. p. 414, t. xxxvi. 8 ♂; Butt. Ind. i. p. 140.

A single female from East Pegu sent by Doherty. I have another from Rangoon taken by Major Adamson.

This species may be distinguished from others of the same group by the short band inside the cell of the fore wing beneath, and by the ocelli of the hind wing below, which have black centres broken into numerous minute dots.

LETHE CHANDICA.

Debis chandica, Moore, Cat. E. I. C. i. p. 219; Butt. Ind. i. p. 149.

Karen Hills at low elevations.

LETHE SIDONIS.

Debis sidonis, Hew. Ex. Butt. iii. *Debis,* t. iii. 16 ♂; Butt. Ind. i. p. 159.

Specimens from the Naga Hills agree with those from Khasia in being larger, brighter, and better marked below than Sikkim specimens; they are, however, hardly separable.

LETHE SIDEREA.

Lethe siderea, Marsh. J. A. S. B. xlix. pt. ii. p. 246 (1880); Butt. Ind. i. p. 159.

Occurs near Bernardmyo and agrees perfectly with Sikkim specimens.

ZOPHOESSA SURA.

Zophoessa sura, Doubl. & Hew. Gen. D. L. ii. p. 362, t. 61. 1; Butt. Ind. i. p. 164.

Common near Bernardmyo at 6000 feet.

ZOPHOESSA YAMA.

Zophoessa yama, Moore, Cat. E. I. C. i. p. 221; Butt. Ind. i. p. 169.

Also common near Bernardmyo and in the Naga Hills. It is remarkable that this genus, which is so well represented in Sikkim, where eight of the nine known Indian species are found, should have produced no species peculiar to the more eastern hill-tracts, except *Z. andersoni*, which Mr. Doherty did not take.

Several other species occur, however, in Western China.

NEOPE PULAHA.

Lasiommata? pulaha, Moore, Cat. E. I. C. i. p. 227.

Neope pulaha, Butt. Ind. i. p. 170.

Very abundant in the Karen Hills at 4000–5000 feet, and occurs also in the Naga Hills.

The Burmese form of this species differs from that found in the Himalayas and Naga Hills slightly but so constantly that it might almost be separated.

A series of six pairs from Sikkim and the same number from the Karen Hills show the following points of distinction are constant:—

Above, the spots in the Karen-Hill specimens are paler. Beneath, all the markings are lighter in tint, especially the ocelli of the hind wings and the broad lunules outside them, which are fulvous instead of dark brown. A single male from the Naga Hills does not show these differences so clearly, but is nearer to the Burmese than to the Sikkim form.

Until I see more specimens from intermediate localities to prove that the transition is not gradual, I think it will be best to allow this form to remain unnamed.

Neope agrestis, Oberthür, from Ta-tsien-lo, is a smaller species, which seems nearly allied to *pulaha*, but distinct.

NEOPE BHADRA.

Lasiommata? bhadra, Moore, Cat. E. I. C. i. p. 227.

Neope bhadra, Butt. Ind. i. p. 171.

Occurs in the Karen Hills at 4000–5000 feet, but, except that the markings of the hind wings are somewhat paler, does not differ from Sikkim and Khasia specimens.

NEOPE ARMANDII.

Satyrus armandii, Oberth. Et. Ent. ii. p. 26, t. 11. 5 ♂ (1876).

Neope khasiana, Moore, Trans. Ent. Soc. 1881, p. 306; Butt. Ind. i. p. 172.

Doherty sent two males from the Naga Hills and one from Bernardmyo. I should have been inclined to refer these to two species if I had not seen a large series of specimens from Western China in Mr. Leech's collection, showing with some variation the same differences of colour on the hind wing as the Naga specimens, which are undoubtedly *khasiana*, Moore, do from the Bernardmyo one, which is inseparable from *armandii* and differs in having the outer part of the hind wing yellowish instead of brown. The Chinese specimens in Mr. Leech's collection belong to both forms, and seem by their labels to occur in the same localities; there are also some more or less intermediate specimens. The pattern of the underside in this, as in most other Satyridæ, is the surest guide.

NEOPE MUIRHEADI.

Lasiommata muirheadi, var. *bhima*, Feld. Wien. ent. Mon. vi. p. 28 (1862).

Neope bhima, Marsh. J. A. S. B. xlix. pt. ii. p. 246 (1880); Butt. Ind. i. p. 172, t. xi. 26 ♀.

I have several specimens taken by Doherty in the Karen Hills and at Momeit, Upper Burmah, at 1500–2000 feet, also two from Dr. Manders taken in the Shan Hills, which seem to show that this species cannot be specifically separated from *N. muirheadi.* Of the latter I have three males from Ningpo, the original locality, which are easily distinguished by the small ocelli almost obsolete on the upperside and the less distinct markings, and in some cases almost obsolete white band on the hind wings below.

But three males and two females from Kiukiang and a female from near Shanghai show that these characters are not at all constant, and the ocelli of the Chinese females are like those of the Burmese males. The Burmese female I have resembles the plate but is larger, whilst the males have only one or two small brown marks on the upperside of the fore wing instead of the three well-marked ocelli beneath.

These four species are all the *Neopes* known to occur in India, as I think that *N. moorei*, Butl., may be dropped from the list altogether, as a very doubtful species of still more doubtful origin.

RAPHICERA SATRICUS.

Lasiommata satricus, Doubl. & Hew. Gen. D. L. t. 64. 4.

Raphicera satricus, Butt. Ind. i. p. 175.

Occurs in the Naga Hills at 6000–7000 feet.

SATYRUS LOHA.

Aulocera loha, Doh. J. A. S. B. lv. pt. ii. p. 118 (1887).

Satyrus loha, Elwes, Trans. Ent. Soc. 1888, p. 323, t. ix. 6 ♂.

Two females from Mao on the Manipur frontier of the Naga Hills, taken at 8500 feet in August by Doherty, and marked by him "*loha* apparently," also seem to me to belong to this species, but without the male sex it is not possible to distinguish it certainly from *S. padma*.

RAGADIA CRISIA.

Euptychia crisia, Hübn. Zutr. ex. Schm. t. 675, 676 (1832).

Ragadia crisia, Dist. Rhop. Mal. p. 420, t. xix. 7.

Seems to be common at Perak.

RAGADIA CRITO.

Ragadia crito, de Nicév. Journ. Bomb. Nat. Hist. Soc. v. p. 199 (1890).

Several specimens from Margharita in Upper Assam agree with typical specimens from Bhutan.

YPTHIMA METHORA. (Plate XXVII. fig. 1, ♂.)

Ypthima methora, Hew. Trans. Ent. Soc. ser. 3, ii. p. 291, t. xviii. 20, 21 ♀ (1864); Elwes, *op. cit.* 1888, p. 326; de Nicév. J. A. S. B. vol. lv. pt. ii. p. 233 (1887).

In writing of this species only two years ago I endeavoured to show how the form which I believed to be identical with Hewitson's species might be distinguished in Sikkim from *Y. sakra*, Moore, and from *Y. philomela*, Hübn., with which I thought it had been confused by Marshall and de Nicéville.

I have now received numerous specimens of three forms of *Ypthima*, collected by Doherty in Eastern Pegu at 2000 feet elevation and upwards, which I find it difficult to name with certainty. The difficulty arises from the fact that the types of *Y. methora* in Hewitson's collection are females, and therefore we are unable to say whether it belongs to the group in which the male is characterized by the presence of a sexual mark or patch of raised scales on the upperside of the fore wing, as seen in *Y. philomela* and *Y. motschulskyi*, or whether it is, as I supposed, more nearly allied to *Y. sakra*, in which there is no sexual mark.

Of the three forms now in question from Burmah, one is what is spoken of as *Y. methora* by Marshall and de Nicéville in Butt. Ind. i. p. 215, of which *Y. marshalli*, Butl., is the cold-weather form, with minute ocelli, and which has been bred from *Y. philomela* at Calcutta by de Nicéville (*cf.* J. A. S. B. lv. pt. ii. 1886, p. 231).

The male has a more or less indistinct sexual patch, which in some quite fresh specimens is hardly if at all visible, and which makes me doubt the propriety of using this as a character on which the genus can be divided into groups[1]. The ocelli are constant in number and position but variable in size. The underside is crossed by three distinct bands.

The second form is like it but smaller, with the inner and middle bands on the underside almost obsolete, and but for the faintness or absence of the sexual patch would, without any hesitation, be called *Y. philomela*.

The third is much larger, with larger ocelli, and agrees with what I spoke of as the rainy-season brood of *Y. methora* in my Sikkim Catalogue, which I have from Sikkim, Bhutan, the Khasia and Naga Hills, except that the underside is much paler and the ocelli even more prominent, especially the second one on the hind wing above. This is the more remarkable because the specimens appear to have been taken at a time, March and April, when the form with minute

[1] Since writing this I have seen very large numbers of *Ypthimæ* in Mr. Leech's collection from China, which tend to confirm my opinion that the so-called sex-mark is an inconstant character. Some of these are *Y. motschulskyi*, which normally has a well-defined sex-mark, but in others from the same locality this is faint or altogether wanting, and the variation in size and in the striation of the underside is so great that one cannot tell whether they belong to one or more species. Seasonal dimorphism does not seem to occur in China in this genus or in *Mycalesis* to anything like the same extent as in India, which is only to be expected when we know how different are the seasons.

ocelli occurs in Sikkim and when it would have been expected also in Burmah.

This last form has no trace of a sexual patch or of transverse bands on the underside, and might be considered a form of *Y. sakra* as it was by Doherty, who wrote *Y. nikæa* on the paper, this name being considered both by de Nicéville and myself as little more than a synonym of *Y. sakra*.

It would appear from these specimens that although in Sikkim, whence we have much larger series taken at all seasons, *Ypthima sakra, methora,* and *philomela* are distinguished by fairly good characters, in East Pegu the same characters do not hold good; and that neither the sexual patch nor the striation or bands of the underside can be relied on to separate or name them. I hope, however, that by pointing out the difficulties which arise, collectors in different parts of Burmah may be led to take particular notice of the species of *Ypthima*, and if possible clear up the confusion which at present exists among them.

YPTHIMA SAKRA.

Yphthima sakra, Moore, Cat. E. I. C. i. p. 236; Butt. Ind. i. p. 232, t. xvii. 67 ♂.

Specimens of this, which agree well with those from Sikkim and the Khasias, were sent from the Naga Hills as well as from Bernardmyo.

YPTHIMA PANDOCUS.

Y. pandocus, Moore, Cat. E. I. C. i. p. 235; Butt. Ind. i. p. 223.
Y. corticaria, Butl. Trans. Linn. Soc., 2nd ser. Zool. i. p. 537 (1879).

Common at Perak in January and February.

YPTHIMA NARASINGHA. (Plate XXVII. fig. 2, ♀.)

Y. narasingha, Moore, Cat. E. I. C. i. p. 236; Butt. Ind. i. p. 225.

Taken by Doherty at Bernardmyo in May.

The female, which is undescribed, differs from the male in being larger, of a greyer tint above, and a more greenish shade on the underside. The striation of the underside is less marked than in Hewitson's type specimen.

I doubt the occurrence of this species in Sikkim, where it has never been found by any recent collector, and believe that this is the first time that it has been found since Hewitson described it. Doherty supposed it to be a new species of *Callerebia*, to which genus it seems to have as much or more resemblance than to *Ypthima*.

ERITES MEDURA.

Hipparchia medura, Horsf. Cat. E. I. C. pt. ii. t. v. figs. 8, 8 *a* (1829).
? *Erites angularis,* Moore, P. Z. S. 1878, p. 825; Butt. Ind. i. p. 236, t. xvi. 50 ♀.

Numerous specimens were sent by Doherty from East Pegu, taken at about 1500 feet, of which several females and one male were by him supposed to be, and marked as, a distinct species. These correspond to the female taken in the Thoungyeen forests by Major Bingham and described by Marshall and de Nicéville, Butt. Ind. i. p. 237, as nearer to *E. medura* of Java than to *E. angularis*.

After examining the series closely and comparing them with one Javan specimen, I do not see how to separate the two species, for, though in the supposed new species the ocelli on the upperside of the hind wing are much larger than in the other form from the same locality, whilst on the underside both the ocelli and the bands are almost obsolete, I am rather inclined to suspect seasonal dimorphism, and to think that this form is the last of the first brood, and the others, among which males are far more numerous, are the first of a second brood. In the Javan specimen we have the hind wing like one form below and the other above. Further observations are requisite in order to decide the question.

CALLEREBIA ORIXA.

C. orixa, Moore, P. Z. S. 1872, p. 555; Butt. Ind. i. p. 245.

Erebia polyphemus, Oberthür, Et. Ent. ii. p. 33, t. ii. 2 ♂ (1876).

Several specimens from the Naga Hills agree with those I took in the Khasias, and cannot be separated from Chinese examples, of which I have two from near Ichang, two from Ta-tsien-lo, and one from Moupin. The female, which is undescribed, does not differ from the male except in being slightly paler in colour.

CYLLOGENES JANETÆ.

C. janetæ, de Nicév. P. Z. S. 1887, p. 453.

A single male was taken by Doherty in the Naga Hills, and agrees with a specimen from Bhutan in my collection.

ELYMNIAS PENANGA.

Melanitis penanga, Westw. Gen. D. L. ii. p. 405.

E. penanga, Butt. Ind. i. p. 269.

One specimen was sent from the low country of East Pegu, another from Perak.

ELYMNIAS OBNUBILA.

E. obnubila, Marsh. Butt. Ind. i. p. 272.

Rare in the Karen Hills at about 2000 feet in April; Doherty says that he has also taken it west of Bassein.

ELYMNIAS PEALI.

Elymnias peali, Wood-Mason, Ann. Nat. Hist. ser. 5, xi. p. 62, t. ii. (1883).

Dyctis peali, Butt. Ind. i. p. 276.

A single specimen of this distinct species was taken at Margharita in May.

ELYMNIAS PATNA.

Melanitis patna, Westw. Gen. D. L. ii. p. 405.

Dyctis patna, Butt. Ind. i. p. 277.

Two specimens from the Karen Hills taken at 4000 feet.

Though Marshall and de Nicéville have adopted Butler's genus *Dyctis* in their book, their remarks show that they do not believe it to be a natnral one, and my own observations so far as they go lead me to the same opinion.

Subfamily MORPHINÆ.

ZEUXIDIA AMETHYSTUS.

Z. amethystus, Butl. P. Z. S. 1865, p. 485; Dist. Rhop. Mal. p. 72, t. vii. 1 ♂, 2 ♀.

Z. masoni, Moore, P. Z. S. 1878, p. 826; Butt. Ind. i. p. 286.

Several specimens of both sexes were taken at the foot of the Karen Hills by Doherty in March and April, which agree with a male from Perak.

I am unable from these specimens to see how *Z. masoni* differs from *Z. amethystus,* to which both Distant and de Nicéville consider it closely allied. I have another male from Borneo which is identical with the Burmese species.

ZEUXIDIA AURELIUS.

Pap. aurelius, Cram. Pap. Ex. ii. p. 110, t. 168. A, B.

Zeuxidia aurelius, Dist. Rhop. Mal. p. 425, t. xxxvii. fig. 1 ♂.

A single male of this fine species sent from Perak by Doherty was unfortunately much damaged.

AMATHUSIA AMYTHAON.

A. amythaon, Doubl. Ann. Nat. Hist. xix. p. 175 (1847); Butt. Ind. i. p. 291.

? *A. portheus,* Feld. Reise Nov. iii. p. 461 (1865); Butt. Ind. i. p. 293, fig.

? *A. westwoodi,* Butl. Ent. Mo. Mag. vi. p. 55 (1869); Butt. Ind. i. p. 292.

I received three males and a female of this species taken at the foot of the Karen Hills by Doherty, which agree with one from Sikkim in Mr. Godman's collection, identified by him with *A. portheus,* also with a pair taken by Major Bingham in Tenasserim in my collection. I agree with the authors of the 'Butterflies of India' in thinking that only one species is represented by the three names given above.

ENISPE EUTHYMIUS.

Adolias euthymius, Doubl. Ann. Nat. Hist. xvi. p. 179 (1845).

Enispe euthymius, Butt. Ind. i. p. 300.

Seems to be very common in the Karen Hills at 1500–4000 feet.

ENISPE CYCNUS.

E. cycnus, Westw. Gen. D. L. ii. p. 330; Butt. Ind. i. p. 301.

Taken by Doherty in the Naga Hills at low elevations, and also at Bernardmyo.

ÆMONA LENA.

Æ. lena, Atkinson, P. Z. S. 1871, p. 215, t. xii. 1 ♂; Butt. Ind. i. p. 302.

A single male taken by Doherty in the Karen Hills at 2000 feet. It also occurs near Bernardmyo in Upper Burmah.

THAUMANTIS DIORES.

T. diores, Doubl. Ann. Nat. Hist. xvi. p. 234 (1845); Butt. Ind. i. p. 304.

T. ramdeo, Moore, Cat. E. I. C. i. p. 215; Butt. Ind. i. p. 305.

Occurs, but not abundantly, in the Karen Hills.

THAUMANTIS LUCIPOR.

T. lucipor, Westw. Gen. D. L. ii. p. 337 (1851); Dist. Rhop. Mal. p. 77, t. ix. 8 ♂, 9 ♀.

A few specimens in bad order from Perak.

THAUMANTIS NOUREDDIN.

T. noureddin, Westw. l. c.; Dist. Rhop. Mal. p. 78, t. vii. 3 ♂, t. ix. 7 ♀.

Also sent from Perak by Doherty.

THAUMANTIS PSEUDALIRIS.

T. pseudaliris, Butl. Journ. Linn. Soc. vol. xiii. p. 115 (1877); Butt. Ind. i. p. 307; Dist. Rhop. Mal. p. 79, t. viii. 3 ♂.

Seems to be not rare at the foot of the Karen Hills, whence Doherty took several specimens in fresh condition. All these agree with the specimens taken by Major Bingham in Tenasserim, and differ slightly from the type from Malacca in the British Museum, which has the band of the fore wing rather shorter and narrower than my specimens.

STICTOPHTHALMA LOUISA.

Thaumantis louisa, Wood-Mason, J. A. S. B. xlvii. pt. ii. p. 175 (1878).

Stictophthalma louisa, Butt. Ind. i. p. 311.

This species, which was hitherto only known in Europe from the few specimens taken in the Thoungyeen Valley by Major Bingham, seems to be very numerous at the foot of the Karen Hills, where Doherty took many males, but only two or three females, in March and April. They do not vary appreciably, and in colour are just halfway between *S. camadeva* and *S. howqua,* but perfectly distinct from both.

Clerome gracilis.

C. gracilis, Butl. Ann. Nat. Hist. ser. 3, xx. p. 401 (1867); Dist. Rhop. Mal. p. 81, t. viii. 1 ♂.

A good species, of which four males and two females were sent from Perak by Doherty. The female, which was unknown to Distant, differs only in the shape of the wings.

Clerome arcesilaus.

C. arcesilaus, Fabr.; Butt. Ind. i. p. 313.

Also taken at Perak by Doherty, and constantly distinct from the last, which is smaller and of a different colour below.

Melanocyma faunula.

Clerome faunula, Westw. Gen. D. L. ii. p. 334, t. 54. 1 ♀ (1851); Dist. Rhop. Mal. p. 81, t. viii. 2 ♀.

Clerome (Melanocyma) faunula, Westw. Trans. Ent. Soc. n. s. iv. p. 186, t. 21. 2 ♀ (1858).

A good series of this fine species were sent from Perak by Doherty. As the male does not seem to have been described, I may note that it has a curious sexual character in the shape of a large tuft of grey hairs between the submedian and internal veins of the hind wing near the anal angle. The same tuft exists, but in a much less developed form, in the male of *Clerome assama*, Westw., and seems to have been overlooked in the 'Butterflies of India' as well as by Westwood, though it has been remarked as occurring in *Xanthotænia busiris.* On this account and on account of its very different appearance from any other of the genus *Clerome* known to me, I think Westwood's genus should be adopted.

Xanthotænia busiris.

Clerome (Xanthotænia) busiris, Westw. Trans. Ent. Soc. n. s. iv. p. 187 (1858).

Xanthotænia busiris, Dist. Rhop. Mal. p. 82, t. v. fig. 7; Butt. Ind. i. p. 284.

A pair sent from Perak by Doherty.

Eurytela horsfieldii.

E. horsfieldii, Bdv. Faun. Ent. Mad. p. 54, ♀; Butt. Ind. ii. p. 12, t. xviii. 69.

Two males were sent from the Karen Hills by Doherty, and I have another from Singmo in the Shan States taken by Dr. Manders.

Eurytela castelnaui.

E. castelnaui, Feld. Wien. ent. Mon. iv. p. 401 (1860); Reise Nov. t. 61. figs. 5, 6.

Seems not common at Perak, as Doherty sent four males only, but no female. They are somewhat larger than, but otherwise identical with, a specimen from Borneo.

TERINOS ROBERTSIA.

T. robertsia, Butl. Ann. Nat. Hist. ser. 3, xx. p. 399, t. viii. 2–4 (1867).

Several pairs of this pretty species from Perak.

TERINOS CLARISSA.

? *T. clarissa*, Bdv. Sp. Gén. i. t. ix. 4 (1836); Butt. Ind. ii. p. 39, t. xxiii. 101 ♂.

? *T. teuthras*, Hew. P. Z. S. 1862, p. 89; Dist. Rhop. Mal. p. 183, t. x. 6 ♂.

A single male from Perak agrees with de Nicéville's figure of a Tenasserim specimen except in wanting the white spot on the underside and having the velvety patch of fore wing rather larger. It agrees even better with Distant's plate of *T. teuthras*, but without seeing a series I am not able to say whether there are two species or not. A Bornean specimen in my collection has the ochreous border of the hind wing very much larger and brighter than the Perak one.

STIBOCHIONA NICEA, var.

Adolias nicea, Gray, Lep. Nepal, p. 13, t. xii. 1 (1846).
Stibochiona nicea, Butt. Ind. ii. p. 120, t. xix. 81 ♂.

Doherty sent four males and one female from the Karen Hills taken at about 4000 feet, of which one was marked by him "new sp.," and which at first sight seem very different from *S. nicea* and nearer to the Javan *S. coresia*. They are small, with a broader white border to the hind wings than is found in Indian specimens and a second blue line inside this border. I have, however, females from Bhutan and Khasia which are nearly the same, and therefore doubt the propriety of separating them. No species of this genus is recorded by Distant from the Malay Peninsula. Mr. Doherty calls attention to the hairy eyes in this genus, which he says is its most remarkable feature.

HELCYRA HEMINA.

H. hemina, Hew. Trans. Ent. Soc. ser. 3, ii. p. 245, t. xv. 1 (1864); Butt. Ind. ii. p. 45, t. xix. 83 ♂.

One male from the Naga Hills and four from the Ruby-Mine district, taken in June.

SEPHISA CHANDRA.

Castalia chandra, Moore, Cat. E. I. C. p. 200, t. vi. *a*. 4.
Sephisa chandra, Butt. Ind. ii. p. 46.

Two males from the Naga Hills agree with Sikkim specimens.

APATURA ULUPI.

A. ulupi, Doh. J. A. S. B. 1889, p. 125, t. x. fig. 2 ♂.

One of the types of this very distinct species was sent by Doherty from Margharita and is in my collection.

CIRRHOCHROA BAJADETA.

C. bajadeta, Moore, Cat. E. I. C. p. 150, t. iii. *a*. 3 (1857).

Two specimens from Perak agree with a Sumatran one in my collection.

CIRRHOCHROA ORISSA.

C. orissa, Feld. Wien. ent. Mon. iv. p. 399 (1860); Reise Nov. t. 49. 7, 8.

A few examples of this distinct species from Perak.

NEPTIS DINDINGA.

? *N. dindinga*, Butl. Trans. Linn. Soc., 2nd ser. Zool. i. p. 542, t. 68. 6 (1879); Dist. Rhop. Mal. p. 151, t. xvii. 5 ♀; Butt. Ind. ii. p. 80.

I have a pair from the foot of the Karen Hills, of which the female agrees with Distant's plate; the male is much smaller, and has the outer fulvous line on the hind wing almost absent, whilst in a specimen from Moulmein, from whence the type came, it is quite gone, and the markings of the underside are much more diffuse. In this specimen also the orange band on fore wing above extends below the median nervure.

I have another specimen from Bernardmyo, and one from Pyanyoung in the Shan Hills collected by Dr. Manders, which agree above with the Karen-Hill female, but are much paler below, and have the markings partly obsolete.

After studying de Nicéville's key to this genus in the second vol. of the 'Butterflies of India,' I am inclined to think that some of the characters used by him are too variable to be relied on, and that there are not nearly so many species of *Neptis* as he allows. The group requires to be studied with much larger material than he possessed, and the actual types would then be of very little importance, as they represent individuals rather than species.

NEPTIS RADHA.

N. radha, Moore, Cat. E. I. C. i. p. 166, t. iv. *a*. fig. 4; Butt. Ind. ii. p. 84.

A single male, very pale in colour, from Bernardmyo, and two or three more from the Naga Hills at 6000 feet.

NEPTIS MIAH.

N. miah, Moore, l. c. p. 164, t. iv. *a*. fig. 1; Butt. Ind. ii. p. 85.

Occurs in the Naga and Karen Hills, and seems to vary a good deal in the breadth and position of the bands of the hind wing; a single male from Perak has much less of the purplish colour below, and may be another species.

NEPTIS ANANTA.

N. ananta, Moore, l. c. p. 166, t. iv. *a*. fig. 3; Butt. Ind. ii. p. 85.

Occurs in the Naga and Karen Hills at 4000–6000 feet.

NEPTIS ANJANA.

N. anjana, Moore, Trans. Ent. Soc. 1881, p. 309; Butt. Ind. ii. p. 92.

This species seems common in the Karen Hills at 4000–5000 feet. A single specimen was also sent from Perak by Doherty.

NEPTIS CARTICA, var. BURMANA.

N. cartica, Moore, P. Z. S. 1872, p. 562; Butt. Ind. ii. p. 89.

N. burmana, de Nicév. Butt. Ind. ii. p. 89 (1886).

A single female, which I can only refer to this species, was taken by Doherty in the Karen Hills. It differs from females of *N. cartica* from Sikkim in the points mentioned by de Nicéville, except in the hind wing below, and is not, in my opinion, specifically distinct from that species, though more specimens are necessary to decide the question.

NEPTIS AMBA, var. CARTICOIDES.

N. amba, Moore, P. Z. S. 1858, p. 7, t. xlix. 4; Butt. Ind. ii. p. 88.

N. carticoides, Moore, Trans. Ent. Soc. 1881, p. 309; Butt. Ind. ii. p. 90.

Several specimens from the Karen Hills, taken at 4000–5000 feet, agree with Sikkim examples in my collection, but are somewhat larger. I think that this form is much nearer to *amba* of the N.W. Himalayas than to *cartica*, and is hardly separable from it. De Nicéville says the markings of *carticoides* are narrower and tinged with fuliginous, but I find considerable variation in both respects in *amba*, and the range of the species appears to be continuous.

NEPTIS NATA.

N. nata, Moore, Cat. E. I. C. i. p. 168, t. iv. *a*. fig. 6; Butt. Ind. ii. p. 100.

?*N. khasiana*, Moore, P. Z. S. 1872, p. 562, t. xxxii. 7; Butt. Ind. ii. p. 100.

A single female from the Karen Hills agrees with the plate and description of *nata* very fairly and with a specimen from Moulmein taken by Major Adamson. Another specimen from him, marked "Akyab, March '83, rare," is intermediate between *nata* and *khasiana*, of which I have two specimens, taken by Doherty in the Dhansiri valley of Upper Assam.

NEPTIS DURYODANA.

N. duryodana, Moore, P. Z. S. 1858, p. 10, t. xlix. 8; Butt. Ind. ii. p. 101.

Seems common at Perak. Very like the last above, but distinguished by the basal band of hind wing below being double instead of single.

NEPTIS EURYNOME.

Limenitis eurynome, Westw., Don. Ins. China, p. 66, t. xxxv. fig. 4.
Neptis varmona, Moore, P. Z. S. 1872, p. 561; Butt. Ind. ii. p. 95 *et seq.*

I am unable to separate the numerous forms of this very wide-ranging species, which have been described by Moore as *disrupta*, *adara*, *meetana*, and *kamarupa*, by Butler as *swinhoei*, *eurymene*, and *mamaja*, and which are described and compared as far as possible by de Nicéville, who appears to take much the same view as I do.

If the South-Indian form described as *varmona* be compared alone with the Chinese form called by Westwood *eurynome*, it might perhaps be separated; but on bringing together a very large series of nearly 100 specimens from all parts of India, China, and Burmah, I can find no reason for doing so, and think that they may be considered as the tropical form of *N. aceris*, which occurs in Europe, Amur-land, and Japan, from which they are principally distinguished by the yellower colour of the underside. *N. aceris* is represented in the Himalayas by *N. mahendra*, which I should consider identical with it. *L. eurynome* seems common everywhere, and was taken by Doherty in the Naga and Karen Hills and at Perak.

NEPTIS NANDINA.

N. nandina, Moore, Cat. E. I. C. i. p. 168, t. iv. *a*. 7; Butt. Ind. ii. p. 104.

This species seems fairly distinct though nearly allied to *N. aceris*; de Nicéville says that it may be recognized by the sudden widening out at the costa of the discal band on underside of hind wing. This I find to be hardly the case in my series. I should say rather that the band becomes gradually broader in nine cases out of ten. I received specimens from Bernardmyo and the Karen Hills, where it seems to be fairly common. *Neptis clinia* of Moore, vaguely recorded from Bengal and Siam, may, I think, be dropped from the Indian list as a form which cannot be identified.

PENTHEMA DARLISA.

P. darlisa, Moore, P. Z. S. 1878, p. 829; Butt. Ind. ii. p. 145.

Two or three in bad condition from the foot of the Karen Hills.

LIMENITIS ZAYLA.

L. zayla, Doubl. & Hew. Gen. D. Lep. t. xxxv. 4; Butt. Ind. ii. p. 159.

Not a rare species in the Naga Hills, and does not differ from Sikkim specimens.

LIMENITIS DUDU.

L. dudu, Westw. Gen. D. Lep. ii. p. 276 (1850); Butt. Ind. ii. p. 159.

Also found in the Naga Hills.

LIMENITIS DANAVA.

L. danava, Moore, Cat. E. I. C. p. 180, t. vi. *a.* 2; Butt. Ind. ii. p. 157.

Less common than the last two in the Naga Hills; a female from there is darker in colour than others from Sikkim and Landour.

ATHYMA KANWA.

A. kanwa, Moore, P. Z. S. 1858, p. 17, t. li. fig. 2; Butt. Ind. ii. p. 169.

Several males of this were taken in the Karen Hills at 4000–5000 feet.

ATHYMA PRAVARA.

A. pravara, Moore, Cat. E. I. C. p. 173, t. v. *a.* 4; Butt. Ind. ii. p. 170.

Sent by Doherty from Margharita and the Karen Hills.

ATHYMA MAHESA, var. RANGA.

A. ranga, Moore, Cat. E. I. C. p. 175, t. v. *a.* 6; Butt. Ind. ii. p. 172.

A single specimen of this, which I consider to be a form of *mahesa*, taken in March in the Karen Hills.

ATHYMA OPALINA, var. ORIENTALIS.

A. orientalis, Elwes, Trans. Ent. Soc. 1888, p. 354, t. ix. fig. 4 ♂.

Males of this from the Naga Hills are exactly like those from Sikkim, Bhutan, and Khasia, which I called *orientalis*, but two from the Karen Hills are nearer to the typical *opalina*. This inclines me to think that the race is not so constant as I supposed, and I therefore drop the name as a specific one.

NEUROSIGMA DOUBLEDAYI, var.? (Plate XXVII. fig. 7, ♂.)

Acontia doubledaii, Westw. Cab. Or. Ent. p. 76, t. xxxvii. 4 ♀ (1848).

Adolias siva, Westw. Gen. D. Lep. ii. p. 291 (1850).

Neurosigma siva, Butt. Ind. ii. p. 151, t. xix. fig. 80 ♂.

Seems common in the Karen Hills at 4000–5000 feet; but males only were sent.

These are perfectly distinct from the same sex of the form found in Sikkim, Bhutan, and Khasia, having the rufous colour confined to the base of the fore wing only, and not spread over the greater part of the fore and inner half of the hind wing as in Sikkim. In fact they resemble Westwood's figure, which represents a female from the Khasia Hills, except in the absence of a yellow dash near the base of the hind wing. I have a specimen collected by Doherty in the Chittagong Hills, which is like the Sikkim form.

If, therefore, the female from the Karen Hills proves different from the Sikkim and Khasia one, I should have no hesitation in naming this form as distinct; at present, however, we may only have a case of male dimorphism in which the male and female are different in some localities and resemble each other in others.

Two names also exist, of which *siva* is the one most generally used, though *doubledayi* has priority. It is a curious fact that the extremely rare female sex should have first been sent to England, whilst I have never been able to procure one, and de Nicéville had never seen one when the second volume of his book was published. A specimen in Mr. Crowley's collection, however, is exactly like the plate of *A. doubledayi*.

LIMENITIS AUSTENIA.

Lebadea austenia, Moore, P. Z. S. 1872, p. 560, t. xxxii. fig. 1.
Limenitis austenia, Butt. Ind. ii. p. 157.

Four males and a female of this rare species were taken at Margharita in May 1889 by Doherty. According to his observations it is a low-country species.

EUTHALIA TAOOANA.

Adolias taooana, Moore, P. Z. S. 1878, p. 831 ; Butt. Ind. ii. p. 197.

Seems abundant in the Karen Hills at 4000–5000 feet, but only males were sent by Doherty. The female remains undescribed, but probably does not differ materially from the male.

There is some variation in the small spots near middle of the hind margin of fore wing above. Normally there are two, but in some specimens one or both are wanting. On the hind wing above the two uppermost spots are present, but of the lower ones one or both are sometimes absent. The ground-colour of the underside is paler than in any other of the group.

This is nearly allied to *E. confucius* of Westwood, from China, a species which I have not been able to examine.

EUTHALIA NARAYANA.

E. narayana, Grose Smith, Rhop. Ex. pt. xv. p. 6, t. ii. 4, 5 (1891).

I have two males from the Naga Hills differing from each other as well as from *E. nara*. One of them is the same as the form described from the Ruby Mines as *E. narayana*, the other is more like *E. iva*, Moore. I am not able to say without seeing more specimens from different localities whether this should be considered a good species or not.

EUTHALIA NARA, var.

? *Adolias nara*, Moore, Trans. Ent. Soc. n. s. v. p. 78, t. viii. 1 ♀ (1859).
E. nara, Butt. Ind. ii. p. 197.

Two males sent from the Naga Hills by Doherty differ from a pair from Sikkim and others from Khasia in having the spots in the band of fore wing of a greenish rather than a bluish shade. The series of spots on hind wing below are rounder and arranged in a more curved line than in *nara*.

EUTHALIA ANYTE.

Adolias anyte, Hew. Ex. Butt. iii. *Adol.* t. ii. 5 (1862).
E. anyte, Butt. Ind. ii. p. 198.

Occurs in the Naga Hills, whence I have what I take to be the undescribed female of this species. I had it as well from Bhutan and Sikkim, but had confused it with *E. nara*, to which it bears a close resemblance. It may, however, be distinguished by the colour of the underside, which is of a paler green, by the position and shape of the band of spots on hind wing below, which corresponds much better with that of the male *E. anyte* than with *E. nara*, and by the smaller size and rather different shape of the markings at base of hind wings below. In the female from Naga Hills the band below is much shorter than in the Bhutan and Sikkim females, and the corresponding spots above are absent. In the male these white spots take the form of a yellowish patch, varying in size but larger than in the female. The fact that this female has come with the male *anyte* from no less than three localities seems to me to confirm my opinion [1].

EUTHALIA FRANCIÆ.

Adolias franciæ, Gray, Lep. Nepal, p. 12, t. xiv.
E. franciæ, Butt. Ind. ii. p. 202.

Occurs in the Naga and Karen Hills and at Bernardmyo. The specimens vary here as elsewhere in the breadth of the white bands and slightly in the tint of the upperside, but after comparing a large series I do not think any local races can be recognized.

EUTHALIA SATROPACES.

Adolias satropaces, Hew. Ent. Mo. Mag. xiii. p. 150 (1876).
E. satropaces, Butt. Ind. ii. p. 206.

Occurs in the Karen Hills.

? EUTHALIA BIPUNCTATA, var.

? *Adolias bipunctata*, Snell. v. Voll. Tijd. Ent. v. p. 191, t. 10. 4 (1862).

A single male from Perak is unlike anything described by Distant or de Nicéville, and is nearest to one from Padang in Sumatra which is named *bipunctata* by Moore. I have not the original description to refer to, but the species is nearest to *E. kesava* and differs from it in its smaller size, brighter blue border to the hind wings, and beneath in having a series of small pale bluish spots near the apex of fore wing, which in the Sumatran specimen are also obsolete.

[1] Since writing this I have seen in Mr. Leech's collection large numbers of an insect from Western China, described by him as *E. omei*, which evidently represents *E. anyte* in China; the male has the upper part of the hind wing yellowish; the female, which he had described as a different species, is almost exactly similar to the female of *E. anyte* from Sikkim, and confirms the opinion I have expressed above.

? EUTHALIA ALPHEDA.

? *Nymphalis alpheda*, Godt. Enc. Méth. ix. p. 384 (1823).
Euthalia alpheda, Butt. Ind. ii. p. 213.
? *Adolias parta*, Moore, Cat. E. I. C. p. 185.
Euthalia parta, Dist. Rhop. Mal. p. 437, t. xxxvii. 7 ♂.

I received from the Karen Hills many examples of a species which I name *alpheda* with doubt, as the type of Godart is not available, but it is not the same as what I received from Java named *E. alpheda* by Snellen. The male is exactly like the one figured by Distant as *E. parta*, which he says was identified by Moore, though it does not agree with his figure. It is the darkest and most uniformly black of all the species known to me, having only a trace of pale blue at the apex of fore wing below. The female is dull brown, with the usual markings of the group, and a curved series of six pale spots across the fore wing reaching the costa, showing with equal distinctness on both surfaces. Below, the greater part of the hind wing is pale lilac and the outer series of spots faint. This does not agree with Moore's description of *parta* ♀, but it is almost certainly the female of my species, as the number of both sexes showed that it was far commoner than any other in the locality where they were taken.

EUTHALIA ZICHRI, var. ?

? *Adolias zichri*, Butl. Cist. Ent. i. p. 6 (1869).
Euthalia zichri, Dist. Rhop. Mal. p. 438, t. xliii. 6.

A single male from East Pegu, at the foot of the Karen Hills, agrees well with Distant's plate. The type in the British Museum from Borneo is the same above, but differs on the underside; it may be a distinct race, but I cannot judge from one specimen.

EUTHALIA APPIADES.

Adolias appiades, Mén. Cat. Mus. Petr. ii. p. 120, t. ix. 4 ♂; Butt. Ind. ii. p. 207.
? *Adolias xiphiones*, Butl. P. Z. S. 1868, p. 609, t. xlv. 6 ♂; Butt. Ind. ii. p. 209.
Adolias parvata, Moore, P. Z. S. 1878, p. 831, t. lii. 3 ♀.
Euthalia balarama, Moore, P. Z. S. 1865, p. 766, t. xli. 3 ♂.

This seems abundant in the Karen Hills, but I am not able to see how to distinguish it with certainty from *A. xiphiones*, Butl., or *A. balarama* of Moore, which latter Col. Swinhoe also considers distinct. There is much variation in the size and tint of the males, and still more in the females.

The points relied on by Butler and de Nicéville are variable in the male sex; of these I have 6 from Sikkim, 4 from Bhutan (of which 2 are named *balarama*, Moore, by Col. Swinhoe), 1 from Cachar, 2 from Araccan and Moulmein, 1 from Tenasserim, and 3 from the Karen Hills. The southern form is somewhat smaller and darker, but the difference is trifling.

Among the females, 1 from Nepal, 7 from Sikkim, 1 from Bhutan, and 1 from Cachar have the pale band and white spots at apex of fore wing quite or almost obsolete; whilst 1 from Bhutan (named *sahadeva* by Col. Swinhoe), 3 from Cachar, 1 from Khasia, 1 from Burmah, 2 from Tenasserim, and 4 from the Karen Hills have the whitish band more or less well marked, and the apical patches distinct and well defined. Two species might very well be made of the female sex, but as both forms are found in the central part of its range I should rather consider it as a case of sexual dimorphism.

EUTHALIA JAHNU.

Adolias jahnu, Moore, Cat. E. I. C. p. 192 ♀; Butt. Ind. ii. p. 211.

Adolias sananda, Moore, Trans. Ent. Soc. 1859, p. 76, t. vii. 3 ♂.

One male and three females from the Naga and Karen Hills; the latter are rather smaller and paler than those from Sikkim and Khasia.

EUTHALIA KESAVA, var. DISCISPILOTA.

Adolias discispilota, Moore, P. Z. S. 1878, p. 831, t. lii. 2; Butt. Ind. ii. p. 213.

Though the form found in the Karen Hills and Tenasserim is smaller and slightly different in the markings from *kesava* of Sikkim and the Khasias, I hardly think it can be treated as a distinct species; the male in this case is more different from *kesava* than the female, which is almost identical.

ATHYMA NEFTE, var. NIVIFERA.

A. nivifera, Butl. Trans. Linn. Soc., 2nd ser. Zool. i. p. 540, t. 69. 4 (1879).

A. nefte, var. *nivifera*, Dist. Rhop. Mal. p. 163, t. xvi. 6, 7.

A single male from Perak has the white band above suffused and edged with blue. I follow Distant in treating it as a variety of *nefte*, not having the material which would allow me to judge for myself.

ATHYMA KRESNA.

A. kresna, Moore, P. Z. S. 1858, p. 12, t. l. 4 ♂.

A male from Perak agrees with one in my collection from Sumatra.

ATHYMA SULPITIA.

Pap. sulpitia, Cram. iii. t. ccxiv. E, F.

A. sulpitia, Butt. Ind. ii. p. 174.

A specimen from Bhamo, collected by Major Adamson, agrees with Chinese examples from Ningpo and the valley of the Yang-tse-kiang.

ATHYMA SELENOPHORA.

Limenitis selenophora, Koll. Hügel's Kash. iv. p. 426.

A. selenophora, Butt. Ind. ii. p. 176.

Two pairs from the Karen Hills, of which the females are much smaller than any of my Indian specimens.

Athyma zeroca.

A. zeroca, Moore, P. Z. S. 1872, p. 564; Butt. Ind. ii. p. 177.

Several males from the Karen Hills have the apical white spots larger and better marked than in the Himalayas.

Athyma cama.

A. cama, Moore, P. Z. S. 1858, p. 14; Butt. Ind. ii. p. 178.

Two males from the Karen Hills.

Athyma amhara.

A. amhara, Druce, P. Z. S. 1873, p. 344, t. 32. 2; Butt. Ind. ii. p. 181; Dist. Rhop. Mal. p. 162, t. xvi. 5 ♂.

A pair from Perak. What I take to be the female of *A. amhara* agrees precisely with the male on the underside, which is by far the safest guide in this group, but on the upperside differs from the female described by Druce and Distant. It is almost exactly like a small female of *A. selenophora*, but that species is not known to occur so far south, and the underside is also quite different in colour, being dark grey instead of rufous.

Symbrenthia niphanda.

S. niphanda, Moore, P. Z. S. 1872, p. 559; Butt. Ind. ii. p. 243.

Not common in the Naga Hills, where the specimens are larger than in Sikkim, but otherwise quite similar.

Cyrestis nivea.

Amathusia nivea, Zinken-Sommer, Nova Acta, xv. t. xiv. 1 (1831).
Cyrestis nivea, Butt. Ind. p. ii. 252.
C. nivalis, Feld. Reise Nov. iii. p. 414.

Common at Perak. I quite agree with de Nicéville that the Indian form is not separable from *C. nivea*, of which I have both Javan and Bornean specimens.

Cyrestis cocles.

Pap. cocles, Fabr. Mant. ii. p. 7.
C. cocles, Butt. Ind. ii. p. 254.
C. formosa, Feld. Reise Nov. iii. p. 412.
C. earli, Dist. Ann. Nat. Hist. ser. 5, xi. p. 174 (1883); Rhop. Mal. p. 141, t. xiii. 5.

Doherty took both *C. cocles* and *C. earli* at Perak, and a form intermediate between them at Momeit. I quite agree with de Nicéville that these varieties all belong to one species and are too variable to be separated.

Cyrestis periander.

Pap. periander, Fabr. Mant. ii. p. 9.
C. periander, Butt. Ind. ii. p. 255.

Seems common at Perak.

CYRESTIS RISA.

C. risa, Doubl. & Hew. Gen. D. Lep. ii. p. 262, t. xxxii. 4 ; Butt. Ind. ii. p. 256.

Occurs in East Pegu at low elevations.

CYRESTIS RAHRIA.

C. rahria, Moore, Cat. E. I. C. p. 147, t. iii. *a.* 2; Butt. Ind. ii. p. 256.

Appears to be common at Perak.

KALLIMA INACHUS.

Paphia inachus, Bdv., Cuv. Règ. Anim., Ins. ii. t. 139. 3.

Kallima inachus, Butt. Ind. ii. p. 261.

Kallima limborgii, Moore, P. Z. S. 1878, p. 828 ; Butt. Ind. ii. p. 262.

Occurs in the Naga and Karen Hills and Ruby-Mines districts. I can see no reason for separating the Burmese form from that found in Sikkim and the Naga Hills, as they vary in all the characters mentioned by Moore and de Nicéville.

KALLIMA PARALEKTA.

Paphia paralekta, Horsf. Cat. E. I. C. t. 6. fig. 4 (1829).

K. buxtoni, Moore, Trans. Ent. Soc. 1879, p. 10 ; Dist. Rhop. Mal. p. 429, t. 37. 2.

Seems uncommon at Perak. The specimens sent by Doherty agree with Distant's figure and seem to me inseparable from Javan specimens.

KALLIMA KNYVETTI.

K. knyvetti, de Nicév. Butt. Ind. ii. p. 267 (1886).

? *K. alompra,* Moore, Trans. Ent. Soc. 1879, p. 14.

Seems to be not uncommon in the Naga Hills at about 5000 feet. The female, which is undescribed, differs from the male in having the apex of the fore wing very much produced and a large hyaline spot. Whether *K. alompra* is the same or not I cannot say ; but if it really occurs in Burmah it is probably the same, as no other blue *Kallima* has been taken in Burmah to my knowledge since it was described, and by the description it cannot be separated. As, however, this must remain uncertain, I think de Nicéville's name had better stand.

CHARAXES DELPHIS.

C. delphis, Doubl. Ann. Soc. Ent. Fr. 1843, p. 217, t. vii. ; Butt. Ind. ii. p. 272.

Two specimens from the foot of the Karen Hills.

CHARAXES SCHREIBERI.

Nymphalis schreiberi, Godt. Enc. Méth. ix. Suppl. p. 825.

Charaxes schreiberi, Butt. Ind. ii. p. 274.

Doherty picked up a tattered male of this insect in the streets of Toungoo.

CHARAXES JALYSUS.

C. jalysus, Feld. Reise Nov. iii. p. 438, t. lix. 5 (1866); Dist. Rhop. Mal. p. 108, t. xiii. 4.

Two specimens from the Karen Hills.

CHARAXES DURNFORDI.

C. durnfordi, Dist. Ent. 1884, p. 191; Rhop. Mal. p. 432, t. xl. 8.

Several specimens were taken by Doherty at the foot of the Karen Hills which agree with Distant's figure.

CHARAXES LUNAWARA.

C. lunawara, Butl. Lep. Ex. p. 99, t. xxxvii. 2; Butt. Ind. ii. p. 282.

Two specimens agreeing with those from Sikkim were sent from the Karen Hills.

PROTHOË FRANCKII.

Prothoë franckii, Wall. Trans. Ent. Soc. 1869, p. 80.

Prothoë angelica, Butl. Ann. Nat. Hist. ser. 5, xvi. p. 53 (1885) Butt. Ind. ii. p. 295, front fig. 120 (♂).

Prothoë uniformis, Butl. l. c.; Dist. Rhop. Mal. p. 434, t. 38. fig. 4.

Occurs not uncommonly at the foot of the Karen Hills in East Pegu, and at Perak, where the specimens are somewhat larger and have in the male less white in the blue band of the fore wing. I cannot see how to distinguish them from a Sumatran specimen in my collection which is *P. franckii*, and should say that *Prothoë uniformis*, Butl., as figured by Distant from Perak, was also the same species. The females differ in being larger than the males, have the blue band whitish shaded with blue on the edges, and the wings below the band dull greenish instead of bluish black. Mr. Doherty calls attention to the tuft of hairs at the base of the hind wing above in the male; this varies in colour from fulvous to black.

PROTHOË CALEDONIA.

Nymphalis caledonia, Hew. Ex. Butt. i. p. 86, t. 43. 3, 4.

Prothoë caledonia, Dist. Rhop. Mal. p. 110, t. 13. 9.

Three specimens of this splendid species were taken by Doherty at Petichaung, at the foot of the Karen Hills, and two others at Perak.

? RHINOPALPA POLYNICE.

Pap. polynice, Cram. iii. p. 4, t. 195. D, E (♂).

? *Vanessa eudoxia*, Guér. Rev. Zool. 1840, p. 44; Deless. Voy. Inde, p. 73, t. xx. ♀ (1843).

Rhinopalpa fulva, Feld. Wien. ent. Mon. iv. p. 399; Butt. Ind. ii. p. 246, t. xxiii. 102 (♂).

I cannot be sure of the identification of the Burmese *R. fulva* with

R. polynice of Cram., as I have no Javan specimens; but I cannot separate it from those found in Sumatra, and have little doubt that Guérin's plate represents a female from the Malay Peninsula, as I have one from Nias Island which almost exactly agrees with it.

Doherty took two in the Dhansiri valley of Assam, a single specimen at the foot of the Karen Hills, and a pair at Perak, which agree with others from Mergui, Nias, and Sumatra.

RHINOPALPA VASUKI.

Rhinopalpa vasuki, de Nicév. Butt. Ind. ii. p. 247.
Yoma vasuki, Doherty.

I received several pairs of this species from Mr. Doherty, taken near Momeit in Upper Burmah. As they are rather variable I should hardly have seen sufficient reason myself to separate it from *R. sabina*, Cram., which is found in Java and Amboyna; but as I have but one specimen of the latter for comparison, and Mr. Doherty knew both species better than I do, I have followed him in treating it as distinct. His remarks already given (above p. 258) should be noted.

LIBYTHEA NARINA.

Libythea narina, Godt. Enc. Meth. ix. p. 171 (1819).
Libythea rohini, Marsh. J. A. S. B. xlix. pt. ii. p. 248 (1880); de Nicév. Journ. Bomb. Nat. Hist. Soc. 1890, p. 208; Butt. Ind. ii. p. 303, t. xxiv. 114 (♀).

Doherty sent two specimens of this taken in the Dhansiri valley of Upper Assam in June 1889, and found it common near Momeit in Upper Burmah in June 1890, at about 2000 feet.

It agrees very fairly with specimens from Celebes and Amboina in Mr. Godman's collection, which confirms the identification made by de Nicéville, and cited above. There is some variation in the size and colour of the spots and band above and of the markings beneath, but the species is perfectly distinct from either of the others found in India.

ARASCHNIA PRORSOIDES, n. sp. (Plate XXVII. figs. 5 ♂, 6 ♀.)

Vanessa prorsoides, Blanch. Comptes Rend. Acad. Sci. lxxii. p. 810 (sine descr.) (1871).

This is one of the most interesting additions made by Mr. Doherty to the Indian fauna and was taken abundantly by him above Mao, on the Manipur side of the Naga Hills, at 6000–8000 feet elevation, in Aug.–Sept. 1889, where it was common in open ground near water; the larva feeds on a species of nettle. I identify it with Blanchard's species by a specimen taken by the Abbé David at Moupin, which I received under that name from the Paris Museum, and which agrees with numerous others taken by Mr. Pratt at Ta-tsien-lo in East Tibet.

It is nearest to the large form of *L. levana* var. *prorsa* found in Japan, but may be distinguished by the narrower and straighter white band of the hind wings, beneath by the absence of the broad chocolate outer band.

It may be described as follows:—Above most like the European form *porima*, Ochs., but has the broad band on the fore wing above in a straight line with that on the hind wing, and the outer bands paler and straighter than in European or Japanese specimens. Beneath, the general coloration and markings resemble *burejana* more than *porima*, but this species is paler than either, and has a lilac patch round the white marginal spots on both wings as in *burejana*.

In size it is constantly much larger than European and rather larger than Japanese specimens; the margin of the hind wing is also much more scalloped out between the veins.

It is perfectly distinct from *A. burejana*, of which I have a large peculiar race, or new species, from Central China.

Subfamily Nemeobiinæ.

Zemeros flegyas, var. albipunctata.

Zemeros albipunctata, Butl. Cist. Ent. i. p. 236 (1874); Dist. Rhop. Mal. p. 187, t. xviii. 12 (♀).

A local race of *Z. flegyas*, which at Perak seems fairly constant. In the Karen Hills a pale yellowish race of *Z. flegyas* is found.

Zemeros emesoides.

Zemeros emesoides, Feld. Wien. ent. Mon. iv. p. 396 (1860); Dist. Rhop. Mal. p. 188, t. xviii. figs. 3, 4.

Taken at Perak by Doherty.

Abisara neophron.

Sospita neophron, Hew. Ex. Butt. ii. *Sospita*, i. 3 (1860); Butt. Ind. ii. p. 321.

Seems common in the low country of East Pegu.

Abisara chela.

Abisara chela, de Nicév. J. A. S. B. lv. pt. ii. p. 252, t. xi. 7 (1887); Butt. Ind. ii. p. 322.

Two specimens from the Naga Hills at 3000 feet elevation agree with Sikkim examples.

Abisara savitri.

Abisara savitri, Feld. Wien. ent. Mon. iv. p. 397 (1860); Dist. Rhop. Mal. p. 189, t. xviii. fig. 5.

Taken at Perak by Doherty.

Abisara kausambi.

Abisara kausambi, Feld. Wien. ent. Mon. iv. p. 397 (1860); Dist. Rhop. Mal. p. 189, t. xviii. figs. 10 ♂, 11 ♀; Butt. Ind. ii. p. 323.

Of this very variable insect, which should probably bear the name of *A. echerius*, Stoll., widely differing specimens were taken at Perak and in East Pegu; but I quite agree with de Nicéville that it is not possible to recognize even as local races the various forms named by Moore.

ABISARA FYLLA.

Taxila fylla, Doubl. & Hew. Gen. Diurn. Lep. ii. p. 422, t. lxix. 3 ♂.

Abisara fylla, Butt. Ind. ii. p. 321.

Seems abundant in the Naga Hills, as also in East Pegu and the Bernardmyo district.

TAXILA HAQUINUS and var. FASCIATA.

Pap. haquinus, Fabr.

Abisara haquinus, Dist. Rhop. Mal. p. 190, t. xviii. 13 (♀).

Taxila fasciata, Moore, P. Z. S. 1878, p. 832, t. lii. 1 (♂); Butt. Ind. ii. p. 318.

There appear to be two forms of this, one of which, *T. fasciata*, Moore, distinguished by the absence of rufous colour on the apex of the fore wing in the male and the less rufous tint of the female, is common below the Karen Hills, and occurs also in Tenasserim. In the Malay Peninsula at Perak the form which is identified with *haquinus* (=*drupadi*, Horsf.) occurs. If no intermediate examples exist, these forms can be distinguished.

TAXILA THUISTO.

Taxila thuisto, Hew. Ex. Butt. ii. *Tax.* t. i. figs. 5, 6 (1860).

Abisara thuisto, Dist. Rhop. Mal. p. 191. figs. 51 ♂, 52 ♀.

Two forms of this also occur, of which the one found in East Pegu is distinguished from the one taken at Perak by the band across the apex of the fore wing beneath showing faintly through the deep black of the upperside.

LAXITA DAMAJANTI.

Abisara damajanti, Feld. Wien. ent. Mon. iv. p. 397 (1860); Dist. Rhop. Mal. pp. 192, 449, t. xl. figs. 10 ♂, 11 ♀.

Taxila tanita, Hew. Ex. Butt. ii. *Tax.* t. i. (1860).

Abisara tanita, Dist. Rhop. Mal. p. 192, t. xviii. fig. 14 (♀).

This lovely species, for which I adopt Butler's genus *Laxita* (*cf.* Trans. Linn. Soc., 2nd ser. Zool. i. p. 546 (1879); Butt. Ind. ii. p. 318), was taken at Perak. Distant, though he figures it under both names, gives no reasons for so doing, and I am unable to distinguish two species in the Malay Peninsula.

LAXITA TELESIA.

Taxila telesia, Hew. Ex. Butt. ii. *Tax.* t. i. 1, 2.

Laxita telesia, Butt. Ind. ii. p. 319.

Abisara telesia, Dist. Rhop. Mal. p. 449, t. xl. figs. 2 ♂, 3 ♀.

Two males of this beautiful species from Perak.

LAXITA ORPHNA, var.?

Emesis orphna, Bdv. Sp. Gén. i. t. 21. f. 4 (1836).

Taxila orphna, Hew. Ex. Butt. ii. *Tax.* t. 1. f. 7.

Two specimens from Perak, of which one is like *E. orphna* from

Singapore ; the other bears a note by Doherty as follows :—"This may be a new species. I have caught many males of *orphna*, Bdv., both in Borneo and the Malay Peninsula ; they all had the band broad and equal." The bands of this specimen, however, are not more than half as broad as in *orphna* and are indented in two places on each side, so that they are half divided. It may be only an occasional variety, but in any case I would not separate it without some other specimens.

STIBOGES NYMPHIDIA.

Stiboges nymphidia, Butl. P. Z. S. 1876, p. 309, t. xxii. 1 (♀); Butt. Ind. ii. p. 316, t. xxiv. 119 (♀).

Seems common at Perak. A single female, in which the border is narrower, was taken at Momeit in Upper Burmah at about 2000 feet.

DODONA DIPŒA.

Dodona dipœa, Hew. Ex. Butt. iii. *Dod.* t. i. 3 (1865); Butt. Ind. ii. 311, t. xxiv. 116 (♂).

Taken at about 6000 feet in the Naga Hills by Doherty.

DODONA OUIDA.

Dodona ouida, Moore, P. Z. S. 1865, p. 771 ; Butt. Ind. ii. p. 311.

This seems to be as common in the Karen Hills as in Sikkim and the Khasias.

DODONA ADONIRA.

Dodona adonira, Hew. Ex. Butt. iii. *Dod.* t. i. 1, 2 ; Butt. Ind. ii. p. 312.

Occurs in the Naga Hills at 5000–6000 feet, but not commonly. A single specimen also sent from Bernardmyo.

DODONA DEODATA. (Plate XXVII. fig. 8, ♂.)

Dodona deodata, Hew. Ent. Mo. Mag. xiii. p. 151 (1876); Butt. Ind. ii. p. 312.

? *Dodona longicaudata*, de Nicév. Proc. A. S. B. 1881, p. 121 ; Butt. Ind. ii. 313, t. xxiv. 117 (♂).

Several specimens taken in the Karen Hills at 4000–5000 feet are intermediate between de Nicéville's figure and Hewitson's type, which is much worn and broken. I think that there is little doubt that the two names refer to one species, as the breadth of the white band is variable, the base of the wings above is not really crossed by three bands of brown, but is brown with (in some specimens) indications of the silvery stripes below, and the tails are broken off in the type of *D. deodata*; thus there remains nothing by which to separate them.

I have not, however, any Khasia specimens for comparison, but Doherty, who has seen them, considers it identical.

DODONA EGEON.

Taxila egeon, Doubl. & Hew. Gen. Diurn. Lep. ii. p. 422, t. 69. 2.
Dodona egeon, Butt. Ind. ii. p. 314.

Seems to be fairly common in the Karen Hills at 4000–5000 feet, and occurs also at Bernardmyo. The female is undescribed, and differs considerably from the male in having the yellow markings paler and much more diffused. I have females also from Kulu and Sikkim, which are somewhat darker than these.

EXPLANATION OF PLATE XXVII.

Fig. 1. *Ypthima methora*, Hew., ♂, p. 267.
2. *Ypthima narasingha*, Hew., ♀, p. 263.
3. *Mycalesis dohertyi*, n. sp., ♂, p. 261.
4. *Mycalesis dohertyi*, n. sp., ♀, p. 261.
5. *Araschnia prorsoides*, Blanch., ♂, p. 285.
6. *Araschnia prorsoides*, Blanch., ♀, p. 285.
7. *Neurosigma doubledayi*, var.?, ♂, p. 277.
8. *Dodona deodata*, Hew., ♂, p. 288.

2. Notes on the Birds of the Phœnix Islands (Pacific Ocean). By J. J. LISTER, M.A., F.Z.S.

[Received April 2, 1891.]

The Phœnix Islands are a scattered group of low coral islands lying far out in the South Pacific Ocean, extending from 1° north of the Equator to nearly 5° south of it. They are within 10° to the east of the 180th parallel, which divides east longitude from west.

There are eight islands south of the equator, viz.:—Sydney, Phœnix, Canton or Mary, Hull, Enderbury, Birnie, M'Kean, and Gardner Islands, and two outliers of the group to the north of it—Howland and Baker Islands.

Situated in the dry, comparatively rainless belt which extends some degrees on either side of the Equator, they are uninhabited desolate places only frequented by sea-birds, which resort to them in innumerable multitudes for nesting [1].

The notices of birds of this group with which I am acquainted are the following:—References to some of the islands as localities in Cassin's edition of the 'United States Exploring Expedition, Mammalogy and Ornithology,' and in the 'Fauna Centralpolynesiens' of Finsch and Hartlaub; a description by Canon Tristram of an apparently new species of Duck (*Dafila modesta*, Tristram), and mention of other birds collected by Mr. Arundel in Sydney

[1] Of late years the islands have been turned to account as a source of guano. An interesting general description of these and other guano islands was read by Mr. J. T. Arundel, F.R.G.S., before the Geographical Society of the Pacific, in San Francisco. It was reprinted in the 'New Zealand Herald,' July 5 and 12, 1890. See also J. D. Hague, "On the Guano Islands of the Pacific Ocean" ('Silliman's Journal,' xxxiv. 1862, pp. 224–243).

Island[1]; and the references in the papers of Messrs. Arundel and Hague mentioned in the footnote.

I had the opportunity, thanks to the kindness of Capt. W. J. L. Wharton, R.N., F.R.S., Hydrographer to the Admiralty, of visiting the group in the months of June and July 1889, in H.M.S. 'Egeria.' The islands touched at during the cruise were Sydney, Phœnix, Enderbury, Canton, Birnie, and Hull Islands, but it was only at Phœnix Island and Canton Island that our stay was sufficiently long to allow of any detailed observations on the birds.

Sydney Island, Canton Island, and Hull Island are regular coral atolls, having a complete or nearly complete ring of land enclosing a lagoon. Phœnix Island, Enderbury Island, and Birnie Island are smaller, and in them the lagoon is absent. At Hull Island and Sydney Island the land ring supports an abundant growth of trees; but at the other four islands the vegetation consists only of low bushes with coarse grass and a few trailing shore-plants.

The birds were assembled in the greatest numbers at Phœnix Island. As the 'Egeria' approached, a great column of wheeling Frigate-birds could be seen over one part extending many hundreds of feet up into the air, while at lower levels crowds of other birds flew hither and thither, and the clamorous noise of their cries came over the water from far away.

The island is of a rounded triangular shape, and measures about ½ a mile across. It is surrounded by a narrow reef of coral on which the big rollers, coming up before the trade-wind, break, making a deep undertone to the cries of the birds. On the leeward side there is a gap in the reef, and here a party landed for the purpose of making a survey of the island.

The beach of coral boulders slopes gently up to a height of some 12 to 15 feet above the level of the reef platform. From the top of this beach ridge there is a rather steep slope down to the flat inner part of the island. Thus the island is somewhat saucer-shaped, being flat with a raised margin. At the time of our visit the interior of the island was occupied by a shallow brackish pond with soft muddy sides, and swarming with mosquito larvæ. This probably stood in a depression made when the island was worked for guano. I found only four kinds of plants on the island. The largest of these was a yellow-flowered shrub (*Sida fallax*, Walp.) belonging to the order of the Mallows, and growing from two to three feet high, with trailing branches spreading outwards from the central stems. The others were a coarse grass growing in tussocks and two small trailing plants. Bare tracts of coral-shingle interrupted the covering of vegetation here and there.

I was on the island for about seven hours, and obtained specimens of the following species of birds.

FREGATA MINOR (Gmel.).

From the boat I went off to the part of the island over which the Frigate-birds were wheeling. Here I found their nests in great

[1] P. Z. S. 1886, p. 79.

numbers. They were built of small dead twigs of the plants of the island, placed a foot or so above the ground on the spreading branches of the *Sida* and on the beaten-down tussocks of grass. The nests were placed as near together as supports could be found, and there were well-defined limits to the colonies, although the bushes beyond these limits appeared to be just as well suited for the purpose as those within.

Each nest was occupied by a bird. As one approached some of these took flight and joined the wheeling crowd overhead, but the rest remained sitting and allowed themselves to be touched with the muzzle of my gun, only chattering their bills by way of remonstrance. Both males and females were to be seen engaged in the duties of incubation.

The following table gives the points of difference which I noted between the sexes:—

Males.	*Females.*
Scarlet throat-pouch present.	No throat-pouch.
Long nape- and back-plumes.	No long nape-plumes.
Bill varies in colour from black to grey [1].	Bill varies in colour from pink to grey.
Feet and skin round the eye *black.*	Feet and skin round the eye *red.*
Wing-coverts black.	Wing-coverts pale brown.
Breast and belly dark except for a white streak on each side of the latter. No pale nape-band.	Breast and fore part of belly white; nape-band white to tawny.

A few of the birds had the white or pale tawny heads of the immature plumage. They were in the proportion of about 1 to 100 of those in ordinary plumage. I saw none of these on the nests.

The throat-pouch of the male is a most striking object. When fully distended it reaches forward as far as the end of the bill and downwards so as to completely hide the breast—a great smooth semitransparent balloon of the most brilliant scarlet, which contrasts finely with the dark metallic tints of the plumage. If any of the birds in a group had their pouches distended, there were generally several in this condition, as though they were vieing with one another in the exhibition of their attractions. From several parts of the group came a low vibrating note, a combination of a whistle and a purr accompanied by the sound of the chattering of their bills. While uttering this note the bird leans back on the nest, with the head thrown right back, the pouch fully extended, and the wings half spread and shaken with a quivering movement. The female birds meanwhile were either wheeling overhead or sitting on the edge of the nest near their admirers.

The pouch is not rapidly filled or emptied. When a bird with a half-distended pouch takes flight, the latter is carried from side to side with the movement through the air, gradually diminishing in size. In the undistended state the bare wrinkled skin is completely

[1] When the bills are grey, the colour is due to the rough surface and appears to be a sign of age.

A Colony of Frigate-birds (*Fregata minor*) on Phœnix Island.

retracted to the level of the general contour of the neck. The interior of the pouch is in communication with the air-sacs of the neck; it is therefore filled and emptied through the bronchi. Bands containing blood-vessels, with which the wall of the pouch is very richly supplied, traverse the cavity, passing from the fleshy part of the neck to the outer wall. On blowing through a tube into the great air-sac at the base of the neck, the pouch becomes distended, and remains so if a ligature is tied round the neck, below the pouch.

By far the greater number of nests at Phœnix Island contained a single white egg, about as large as a hen's; some nests, however, contained two eggs. There were no young birds at this island.

At Canton Island, though some nests contained young birds, others were being built. I saw a male bird bringing sticks in his bill to the female, who arranged them in the nest. There are pools of fresh water on this island, and here and at Swain Island (south of the Union Islands), where there is a freshwater lagoon, I saw Frigate-birds coming down to drink. Sweeping down to the surface, they scooped up the water with the lower mandible.

Peale obtained the eggs of Frigate-birds (he does not give the species) in the Caroline Islands (Enderby Island) in January, and at Puka-puka (Honden Island), in the Low Archipelago, in August, and at other islands during the intervening period. He states his opinion that there is no definite period for the nesting of these birds in equatorial regions. The fact that there was not a single unfledged young bird among the thousands of nests with eggs at Phœnix Island shows that the members of this colony had begun nesting at the same time.

PHAETON RUBRICAUDA, Bodd.

There were several of this bird, which ranges through the tropical parts of the Pacific and Indian Oceans. One was caught in its nesting-place, which was in a pile of the rough coral blocks which had been thrown together by the guano-diggers. There was a single egg. At Canton Island I found the birds incubating their solitary eggs on the ground under cover of bushes; they were so tame as to allow themselves to be caught.

The plumage was tinged with a pale pink colour, though more deeply in some than in others.

There were three kinds of Gannets on the island:—*Sula cyanops* (Sundev.), *S. leucogaster* (Bodd.), and *S. piscatrix* (Linn.). These species all have very extensive ranges in the tropics.

SULA CYANOPS (Sundev.).

There were numbers of these birds, some solitary with their eggs and some in groups. The eggs are laid on the ground, singly or in pairs; they are of a pale blue colour almost covered with the white, chalky, uric-acid covering. In some cases there were young birds, who with the parents hissed and barked defiance with great spirit as one approached. It was most amusing to watch the small fluffy young one beside the parent bird joining in and adding its weak notes of defiance to hers. She certainly managed to appear very formidable with her feathers ruffled and powerful yellow bill half open ready for attack, the pupil contracted to a speck in the middle of the bright yellow iris, which gleamed out from the bare dark grey skin surrounding it.

The feet are of a brownish-grey colour.

SULA LEUCOGASTER (Bodd.).

These were less numerous than the White Gannet. The bill is rather less powerful, and is greenish blue, becoming bluer at the base. The iris is grey and the feet a delicate pale green. The young bird has the blue bill and grey iris of the adult, but the feet are pale red. The nest is built of sticks and placed on the bushes like those of the following species.

SULA PISCATRIX (Linn.).

These birds built their nests on the *Sida* bushes a few feet from the ground. They were not in colonies but scattered here and there, and I noticed some in the middle of the Frigate-bird colonies, where they lived apparently in perfect peace with their neighbours, though it is one of the common sights to see the Frigate-birds chasing them out at sea to make them hand over the fish they have caught. The bird has a curiously incomplete look, the feathers not sitting close and smooth as in its allies, and the colours, though bright, appear to be in indifferent taste. The bill is greyish blue, and the bare skin which extends over the lores and behind the eye is bright blue. At the base of both upper and lower mandible is a band of pink gradually blending with the colours behind. The skin between the rami of the mandible and on the 'chin' is dark slate. The feet are of a dark pink, almost magenta.

The eggs of the three species have the pale blue ground-colour almost hidden by the chalky-white covering. Those of *S. cyanops* are much larger than the others. My specimens vary in weight as follows:—

S. cyanops	119 to 144 grs.
S. leucogaster	80 to 88 ,,
S. piscatrix	69 to 83 ,,

At Canton Island a clump of *Tournefortia* trees was habitually used by these birds (*S. piscatrix*) as a roosting and preening place. Among the pieces of down which were sticking to the bare branches, having been preened out of the feathers, was found one entangled with a seed of one of the trailing plants of the island (*Boerhaavia tetrandra*, Forst.), which is beset with glandular hairs. Such an incident indicates a method by which seeds may be distributed from island to island by birds.

TUBINARES.

PUFFINUS NATIVITATIS, Streets[1].

Though this bird was frequently seen both at Phœnix and Canton Islands, I only obtained one egg, which was placed in the interior of a heap of rough coral blocks piled together by the guano-diggers. It is pure white, and of a long oval shape, measuring 2·3 in. in length and barely 1·5 in. in breadth.

The bird was first described from Christmas Island (Pacific Ocean), and two specimens have since been obtained at Krusenstern Island to the west of the Sandwich Islands.

ŒSTRELATA PARVIROSTRIS (Peale[2]).

There were numbers of this species, wheeling rapidly hither and thither near the ground in wide figure-of-8 curves just as the smaller Petrels do over the surface of the sea. They place their eggs, with almost no nest, on the ground under the tangled branches of the bushes. The egg is white, and measures 2·3 in. in length and 1·65 in. in breadth. A newly hatched young one was covered with dark grey down.

The bird appears to be known only from Puka-puka (=Honden or Dog Island, Low or Paumotu Archipelago), near which a single individual was obtained by Peale[3] on the visit of the Wilkes Expedition. This specimen has remained hitherto unique.

FREGETTA ALBIGULARIS (Finsch).

During the middle of the day there were few of these birds to be seen, but towards sunset before we left the island they came in in considerable numbers. I watched one of them beating backwards and forwards over a sandy tract sparsely covered with grass, in which they make their burrows. It was some time before the bird found his home and settled down. I caught it as it was disappearing. On putting my arm into the burrow I found a second bird at the extreme end, which was just as far as I could reach. I found no eggs in the burrows, but on opening one of the birds that I obtained I found an egg ready to be laid in the oviduct.

This egg measures 1·54 in. in length and 1·12 in. in breadth. It is of a creamy-white colour, with minute spots profusely sprinkled at the larger end, but sparsely over the remainder. Those of the deeper layers are pale purple, the superficial ones reddish brown.

The sandy tract above mentioned contained a large number of burrows, so that on walking over it the ground frequently gave under foot.

This bird was first described as a distinct species by Finsch from Kandavu in Fiji[4]. It had been previously obtained from the Marquesas Islands[5] and from the New Hebrides[6].

[1] Bull. United States Mus., No. vii. 1877, p. 29.
[2] Peale, Zoology of United States Exploring Expedition, 1848, p. 298.
[3] Cassin, U. S. Expl. Exped., Mammalogy and Ornithology, p. 411.
[4] Finsch, P. Z. S. 1877, p. 722.
[5] Bp. "Ois. Marquises," Comptes Rend. 1856, xli. p. 1109.
[6] Salvin, P. Z. S. 1879, p. 130.

Laridæ.

Sterna fuliginosa (Gmel.).

Sterna lunata (Peale [1]).

These two species had precisely similar habits. There were thousands of them on the island going about in large flocks, now settled on the ground and now rising with shrill and deafening cries. The flocks were not mixed, each being formed of a single species. The eggs are laid on the bare patches of coral shingle, the two species occupying separate areas. Though I came on several of these patches and collected numbers of the eggs, I never found two eggs together, as though laid by one bird.

The habits of the Sooty Tern (*Sterna fuliginosa*), with regard to the number of eggs it incubates at one time, appear to vary. Pickering states that among the hundreds of eggs he saw at Rosa Island, he saw two eggs together only in two cases [2]. Similarly at 'Wideawake Fair' on Ascension the bird is described as laying only a single egg [3]. On the other hand, Hume found the eggs "two and three together" at the Laccadive Islands [4], and Audubon states that the bird lays three eggs [5] in his description of their nesting-haunts in the Tortugas Keys.

Both Arundel and Hague (*op. cit.*) say that the "Wideawakes," under which term either or both of these species may be included, have two laying-seasons in the year at these islands.

Sterna fuliginosa is found all round the world in the tropics, occasionally visiting our own shores. *Sterna lunata*, which was first obtained by the Wilkes Expedition at various tropical islands of the Pacific, ranges also into the Indian Ocean.

The egg of *Sterna lunata* resembles that of *S. fuliginosa* in colour, but it is smaller and rounder. My largest specimen is 1·68 in. long and 1·26 broad, the smallest is 1 55 in. long and 1 2 broad. The egg is creamy white, profusely and uniformly sprinkled with overlying spots of rich brown and deeper ones of pale purple.

Anous stolidus (Linn.).

These were present in hundreds, going about in large flocks. They have a habit of settling packed together as close as they can stand. I found no eggs, but we came on half-fledged young birds under the tangled branches of the *Sida*.

The bird is distributed through all the tropical seas.

Anous cæruleus (Bennett [6]).

This exquisite little bird is of a delicate silvery-grey colour and the most elegant proportions. They follow one about in parties

[1] Peale, Zoology U. S. Expl. Exped. 1848, p. 277.
[2] Cassin, U. S. Expl. Exped., Zool. p. 388.
[3] Sperling, 'Ibis,' 1868, p. 287. Penrose, Ibis, 1879, p. 278.
[4] Hume, 'Stray Feathers,' 1876, p. 430.
[5] Audubon, 'Ornithological Biography,' vol. iii. p. 266.
[6] Narrative of a Whaling Voyage round the Globe, ii. p. 298 (1840).

of four or six and perch on the top of a rock or shrub close at hand in the most friendly manner.

I found the egg afterwards at Canton Island early in July. It was laid in a hollow among the rough weathered clinkers of coral rock above high-tide level. A few bits of thin shells, pieces of coral, and some sticks composed the nest. There was one egg in each of the two nests I found. The egg is astonishingly large for the size of the bird, measuring 1·5 in. in length and 1·03 in breadth. It is pale cream-colour with a thin uniform sprinkling of small spots, the underlying ones pale greyish brown and indistinct, the superficial ones sharply defined and rich brown.

Peale found the eggs, three in a nest, at Puka-puka or Honden Island in the Paumotu Archipelago, in August[1], and Dr. Gräffe found them at M'Kean Island, in the Phœnix Group, in October and November[2].

The bird ranges widely, at least over the Central Pacific. It has been recorded from Christmas Island[3], Fanning Island[4], the Marquesas[5], the Paumotus[6], and the Phœnix[7] and Ellice Islands[8].

GYGIS CANDIDA (Gmel.).

Abundant here and at Canton Island. They frequently came flying round my head in pairs, uttering their curious nasal note, and approaching so close that I quite naturally put up my hand fancying for the moment they would alight. They lay their solitary eggs on the bare coral rock in the absence of the branches of trees which they use elsewhere. The bird is distributed widely through tropical seas. It appears that it is absent from the shores of Africa and the Malay Archipelago.

There were three kinds of Wading birds on the island—Curlews, Plovers (*Charadrius fulvus*, Gmel.), and Turnstones (*Strepsilas interpres* (Linn.)); but as my specimens came from Canton Island I will defer mention of them to the account of our visit there.

Rabbits are fairly plentiful on the island, having no doubt been left here when it was worked for guano.

A large scarlet Hermit-crab is very abundant, and proved a great nuisance in attacking the birds that were left under shelter, tearing their feet and the bare skin about the throat. The birds arrived at the ship in rather a draggled condition, having been wetted by a shower; some of them had been mauled by the crabs, and, to finish up, they were all more or less soused with sea-water as we were putting off from the difficult landing.

All the time we were on the island there was a deafening clamour

[1] Cassin, U. S. Expl. Exped., Mamm. & Orn. p. 394.
[2] Finsch and Hartlaub, 'Fauna Centralpolynesiens,' p. 240.
[3] Bennett, *loc. cit.*
[4] Arundel; Tristram, Ibis, 1883, p. 48.
[5] Tristram, Ibis, 1881, p. 252.
[6] Peale, Zool. U. S. Expl. Exped., Birds, p. 285.
[7] Finsch and Hartlaub, *loc. cit.*
[8] Whitmee; Sharpe, P. Z. S. 1878, p. 271.

of different birds' notes. They were so numerous that several times when shooting a bird a second dropped as well, happening to come into the line of fire.

I was unable to land at Sydney Island owing to the heavy surf on the beach. A boat effected a landing, but was so much knocked about that no second attempt was made. It was very tantalizing, as the greater part of three days was spent in the neighbourhood of the island making soundings, and a great column of wheeling Frigate-birds could be seen from the ship over one end of the island; and, flying over, I saw Gannets (*Sula*, 2 sp.), Boatswain-birds (*Phaeton rubricauda*), Noddies (one of the large ones and the little *A. cæruleus*), and Terns, and small squads of Curlew, Plover, and Turnstone.

Canon Tristram has described a new species of Pintail Duck (*Dafila modesta*) [1] from this island, which was obtained by Mr. J. T. Arundel.

A stay of only a few hours was made at Enderbury Island, and I had no opportunity of landing. There appeared to be fewer birds here than at Phœnix Island.

We stayed at Canton Island from the 1st to the 9th of July. As above stated this is an atoll-shaped island, formed by a belt of low land enclosing a lagoon, which communicates only by one narrow channel with the sea. Except for a few low bushy thickets of a widely distributed tree (*Tournefortia argentea*, nearly allied to the Heliotrope), this island is as treeless as Phœnix Island. Like that island it is covered with a low bushy growth, but a rather larger list of plants is found, amounting to some 10 species.

All the species of birds which we had seen at Phœnix Island occurred here, except the Little Petrel (*Fregetta albigularis*). Besides the Terns seen there I obtained:—

STERNA BERGII, Lichtenstein,

which ranges throughout the warm parts of the Indian and Pacific Oceans.

STERNA MELANAUCHEN, Temm.

This is a very beautiful little bird, having a black horseshoe-shaped band limiting the white crown, a pale and most delicate shade of slate on the back, and the rest of the plumage white, tinged with a pale rose-colour.

It is found in the Nicobar and Andaman Islands of the Indian Ocean, and across the Malay Archipelago to the western part of the Pacific Ocean, where it has been recorded from New Caledonia, Fiji, Samoa, Tonga, Ponapé, and the Marshall and Gilbert Islands. I failed to find the nest.

[1] Tristram, P. Z. S. 1886, p. 79.

Four species of Charadriidæ were seen on the island.

NUMENIUS TAHITIENSIS (Gmel.).

This curious species of Curlew, which is rare in collections, was abundant at Canton Island, and probably the birds I had previously seen at Sydney and Phœnix Islands belonged to this species.

The character which distinguishes this bird from all others is the peculiar development of the tibial plumes. Their shafts are produced into long shining bristles, which, projecting far beyond the general investment of feathers, produce a curious appearance.

The Curlews were very tame. They went about in parties of six or eight on the open shingly places and sandy shores of the lagoon, or flew round one's head uttering their notes like the words "*turree-turree*."

The species was first obtained at Tahiti on Captain Cook's second visit and described by Gmelin[1]; since this it has been obtained at Vincennes Island in the Paumotus, and at Samoa, the Marquesas, Fanning, Gilbert, Phœnix[2], and Sandwich Islands. Its breeding-haunts appear to be in the far north of the American continent. It has twice been obtained in Alaska[3] in the month of May, where the birds were going about in pairs and were evidently in their nesting-haunts.

CHARADRIUS FULVUS, Gmel.

There were small squads of this widely-distributed bird both here and at Phœnix Island. Several of the males had assumed the fine black front of breeding plumage. I failed, however, to find the eggs or any indication of pairing.

The two forms of this species—Old World and New World—are only distinguished by slight differences of size. The measurements of my Phœnix Island specimens are intermediate, so they cannot be referred to one form or the other.

The only localities in which this bird is certainly known to breed are the tundras of Eastern Siberia on the one hand, and on the other the extreme north of the American continent, beyond the region of forest-growth. Thence they wander down to China, India, the Malay Islands, Australia, and the islands of the Pacific Ocean from the western part of their range and to South America from the eastern[4]. It is remarkable that so many birds should remain in their southern haunts in the height of the breeding-season. The wedding-plumage of the males shows that the birds were not immature.

STREPSILAS INTERPRES (Linn.).

These were also abundant, in flocks of 6 to 20 or so, working along the outer reef platform, or settling close together on the stretches of sand exposed at low tide on the shore of the lagoon. There was no indication of nesting. The bird, as is well known, is cosmopolitan in its range.

[1] Syst. Nat. i. p. 656 (1788).
[2] Obtained by Gräffe at M'Kean Island, Finsch and Hartlaub, *l. c.* p. 177.
[3] Ridgway, Am. Nat. 1874, p. 435. Nelson, Cruise of the 'Corwin,' p. 90.
[4] Seebohm's 'Charadriidæ.'

TOTANUS INCANUS (Gmel.).

A few solitary individuals of this Sandpiper frequented the sandy shores of the lagoon of Canton Island.

The following twenty-six species of birds have been observed at the Phœnix Group [1]:—

CHARADRIIDÆ.	
Charadrius fulvus, Gmel.	Sydney Island (*Arundel*), Sydney, Phœnix, and Canton Islands.
Strepsilas interpres (Linn.)	Sydney, Phœnix, and Canton Islands.
Numenius tahitiensis, Gmel.	Canton Island (Phœnix and Sydney Islands?).
Totanus incanus (Gmel.)	Sydney Island (*Arundel*), Canton Island.
LARIDÆ.	
Sterna bergii (Licht.)	Canton Island.
—— *panaya*, Gmel.	M'Kean Island (*Gräffe*).
—— *fuliginosa*, Gmel.	Phœnix and Canton Islands.
—— *lunata*, Peale	M'Kean Island (*Gräffe*), Phœnix and Canton Islands.
—— *melanauchen*, Temm.	Canton Island.
Anous stolidus (Linn.)	M'Kean Island (*Gräffe*), Gardner Island (*Pickering*), Phœnix and Canton Islands.
—— *cœruleus* (Bennett)	M'Kean Island (*Gräffe*), Sydney, Phœnix, Canton, and Birnie Islands.
Gygis candida, Gmel.	M'Kean Island (*Gräffe*), Sydney, Phœnix, Canton, and Birnie Islands.
PELECANIDÆ.	
Fregata minor (Gmel.)	Phœnix Island.
—— *aquila* (Linn.)	M'Kean Island (*Gräffe*).
Phaeton rubricauda, Bodd.	M'Kean Island (*Gräffe*), Sydney, Phœnix, and Canton Islands.
—— *æthereus*, Linn.	M'Kean Island (*Gräffe*).
Sula leucogaster (Bodd.)	M'Kean Island (*Gräffe*), Sydney, Phœnix, Canton, and Birnie Islands.
—— *cyanops* (Sundev.)	M'Kean Island (*Gräffe*), Gardner Island (*Pickering*), Sydney, Phœnix, and Canton Islands.
—— *piscatrix* (Linn.)	M'Kean Island (*Gräffe*), M'Kean, Gardner, and Sydney (*Pickering*), Canton and Phœnix Islands.
PROCELLARIIDÆ.	
Puffinus assimilis, Gould	M'Kean Island (*Gräffe*).
—— *dichrous*, F. & H.	M'Kean Island (*Gräffe*).
—— *chlororhynchus*, Lesson	M'Kean Island (*Gräffe*).
—— *nativitatis*, Streets	Phœnix and Canton Islands.
Œstrelata parvirostris (Peale)	Phœnix and Canton Islands.
Fregetta albigularis, Finsch	Phœnix Island.
ANATIDÆ.	
Dafila modesta, Tristram	Sydney Island (*Arundel*).

[1] Dr. Gräffe's observations are quoted from Finsch and Hartlaub, 'Fauna Centralpolynesiens'; Dr. Pickering's, from Cassin, 'U. S. Expl. Exped.,' Mamm. & Ornith.; those of Mr. Arundel, from Tristram, P. Z. S. 1886, p. 79. Where no reference is given the observation is mine.

CONTENTS (*continued*).

March 17, 1891 (*continued*).

April 7, 1891.

April 21, 1891.

LIST OF PLATES.

1891.

PART II.

NOTICE.

The 'Proceedings' are issued in *four* parts, as follows:—

Part I. containing papers read in January and February, on June 1st.
II. ,, ,, ,, March and April, on August 1st.
III. ,, ,, ,, May and June, on October 1st.
IV. ,, ,, ,, November and December, on April 1st.

PROCEEDINGS

OF THE

GENERAL MEETINGS FOR SCIENTIFIC BUSINESS

OF THE

ZOOLOGICAL SOCIETY

OF LONDON,

FOR THE YEAR

1891.

PART III.

CONTAINING PAPERS READ IN

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LIST OF CONTENTS.

PART III.—1891.

May 5, 1891.

June 2, 1891.

Contents continued on page 3 of Wrapper.

May 5, 1891.

Prof. Flower, C.B., LL.D., F.R.S., President, in the Chair.

The Secretary read the following report on the additions to the Society's Menagerie during the month of April:—

The registered additions to the Society's Menagerie during the month of April were 83 in number. Of these 37 were acquired by presentation, 23 by purchase, 11 by exchange, 6 were born in the Gardens, and 6 were received on deposit. The total number of departures during the same period, by death and removals, was 73.

The most noticeable additions during the month were:—

1. An adult male example of what appears to be the Lesser Orang (*Simia morio*) of Owen, P. Z. S. 1836, p. 92[1], presented by Commander Ernest Rason, R.N., and received at the Gardens on April 15th.

Commander Rason writes to me that he obtained this animal at Kuching, Sarawak, from some natives, who brought it to him suspended from a pole after the manner of a Sloth. At first it was extremely savage and tried to bite, but soon became comparatively tame, and after a week would allow itself to be carried about and made a pet of. After three months' time he says "George," as he calls the animal, does not seem to have grown in height at all, and, judging by the look of his teeth, must be about ten years old; but having had plenty to eat and little exercise has grown much fatter.

Simia morio is generally stated to differ from the larger *S. satyrus* not only in its smaller size but also in the entire absence of cheek-callosities, which are certainly not apparent in the present specimen. The skull is also stated to be quite different from that of the larger form.

2. An example of the Great-billed Tern (*Phaethusa magnirostris*) from South America, obtained by purchase.

This Tern is new to the collection.

Mr. T. D. A. Cockerell read notes on some Slugs of the Ethiopian Region, based on specimens in the collection of the British Museum.

It having been arranged that a special discussion should be held on the Fauna of British Central Africa, Mr. Sclater opened the subject with the following remarks:—

"British Central Africa" is the official name for that portion of East-African territory under the British sphere of influence which is situated immediately north of the Zambesi. On the south it is bounded mostly by the Zambesi, a corner between the Zambesi and the Lower Shiré having been cut off for the benefit of the Portuguese, while to the east of the Shiré the Ruo forms the southern border. From the highest affluents of the Ruo the boundary runs north to Lake Shirwa, and thence in a slanting line to the eastern bank of Lake Nyassa, which it reaches at about 13° 50′ S. lat. The whole of

[1] See also Rajah Brooke's Note on this subject, P. Z. S. 1841, p. 55.

the western bank of Lake Nyassa belongs to British Central Africa, and I suppose also the western half of the lake, from the end of which the border-line runs irregularly westward to the base of Lake Tanganyika, thus embracing the whole of what is called the "Tanganyika Plateau." On the north-west and west the boundaries of British Central Africa have still to be definitely settled. But it is quite understood, I believe, that lakes Moero and Bangweolo and the adjoining lands to the east come within the sphere of British influence, and that the Barotsi Highlands and the great valley of the Loangwa and its eastern tributaries are also within the area of "British Central Africa."

To govern this enormous territory of perhaps some 500,000 square miles in extent, Lord Salisbury has selected our Fellow, Mr. Henry Hamilton Johnston, C.B., well known to science for his explorations both in the Western and in the Eastern Tropics of the African Continent. Mr. Johnston has already departed from England for the scene of action. But he leaves behind him Mr. Bertram L. Sclater, R.E., the Chief of his Staff, and Mr. Alexander Whyte, F.Z.S., his Naturalist, and for the benefit and instruction of these gentlemen, who have favoured us with their company to-night, I venture to bring before you a few remarks on the Zoology of this part of Africa, chiefly in order to show how little we know and how much we want to know, and to invite you to a discussion on the subject.

Mr. Johnston informs us that he wishes to make a thorough examination of the Fauna, Flora, and Geology of British Central Africa; that is, as already pointed out, of the shores and waters of Lakes Nyassa, Tanganyika, Shirwa, Bangweolo, Moero, and of the Rivers Zambesi, Loangwa, Shiré, &c., and of the country generally comprised between the limits of the left bank of the Zambesi, the east shore of Lake Nyassa, and the southern watershed of the Congo.

I am sure we shall be all glad to help him in such a laudable undertaking, and that he means to attempt what he says is shown by his engagement of Mr. Whyte as Naturalist to his expedition, and by his having supplied Mr. Whyte with all the apparatus necessary for this purpose.

The large area just described as British Central Africa will be divided for administrative purposes, I believe, into three sections:—(1) Nyassa-land, comprising the eastern portion, lying within the basin of Lake Nyassa and the Shiré; (2) Bangweolo-land, comprising the north-western portion draining mostly into the Congo; and (3) Barotsi-land, comprising the south-western portion drained by the upper affluents of the Zambesi. Of the two last-named divisions it may be stated at once that, as regards their zoology, they are absolutely *terræ incognitæ*. They have, in fact, as yet only been visited by a few adventurous travellers, who have not had time nor occasion to attend to natural science. As regards Nyassa-land the case is a little different; a certain number of Europeans, chiefly for missionary purposes, have been settled in several parts of this territory for the past thirty years, and a certain number of zoological specimens have been acquired through their means. I will therefore say a few words upon the general state of our knowledge of the Zoology of Nyassa-land.

So far as we can tell from our present very imperfect knowledge of the subject, the fauna of Nyassa-land will be best considered in three divisions:—(1) the Basin of the Shiré, (2) the Shiré Highlands, (3) the Basin of Lake Nyassa. As regards our knowledge of its Zoology, the following are the principal authorities to be referred to:—

1. Bianconi's 'Specimina Zoologica Mosambicana,' published at Bologna in parts from 1850–67.

Bianconi was Professor of Zoology in the University of Bologna, and described various specimens from the collections sent home to him by Fornasini from Mozambique, in a somewhat antiquated fashion. No complete account of the animals of any branch of zoology is given in his work.

2. Peters's 'Naturwissenschaftliche Reise nach Mossambique,' in four volumes, published at Berlin from 1852 to 1882. This is the most important work that has yet appeared upon the Zoology of South-eastern Africa. Our former Foreign Member, Dr. W. Peters of Berlin, passed six years at various stations in Portuguese East Africa from 1842 to 1848, and made excellent collections in every branch of zoology. Peters, though always hard at work, was somewhat dilatory in publication, and only succeeded in getting out the four volumes above mentioned, though others were in contemplation, and in fact had been partly prepared at the time of his death in 1883. The first volume, published in 1852, gives us an excellent account of the Mammals of Mozambique; the second, intended to contain the Birds, was never published; the third, relating to the Reptiles and Amphibians, was issued in 1882; the fourth, containing the Freshwater Fishes, in 1868. These three volumes were prepared by Peters himself. The fifth volume, devoted to the Insects and Myriapods, was written, except as regards the last-named group, by Peters's colleagues in the Berlin Museum.

3. Finsch and Hartlaub's 'Vögel Ost-Afrikas,' published at Leipzig in 1870. This volume, which forms a portion of Von der Decken's 'Reisen in Ost-Afrika,' is the only general systematic work on the Birds of Eastern Africa yet published. But the discoveries and explorations since made have been so numerous, that Finsch and Hartlaub's work, though nearly exhaustive at the time it was issued, has now become more or less antiquated, and much requires to be replaced by a new publication.

4. Dr. Kirk's "List of the Mammals of Zambesia," published in our 'Proceedings' for 1864.

Dr. Kirk gives notes on 67 species of Mammals met with during his various journeys up the Zambesi and Shiré to Lake Nyassa and on the coast of Mozambique.

5. Dr. Kirk's article "On the Birds of the Zambesi Region," published in 'The Ibis' for 1864 (p. 307).

Dr. Kirk gives notes on 150 species of which he collected examples along the Zambesi, its tributary the Shiré, and on the western shore of Lake Nyassa.

6. In the same volume of 'The Ibis' (p. 301) I gave an account of an excellent collection of rapacious birds made by the late Dr. Dickinson, principally at Chibisa on the Shiré near the upper limit of navigation, where he died in 1863. It contained examples of 22 species.

7. Dr. Günther's Report on the Reptiles and Fishes collected by Sir J. Kirk in the Zambesi and Nyassa Region, published in our 'Proceedings' for 1864 (p. 303). This paper gives a list of 30 Reptiles, 11 Batrachians, and 30 Fishes, of which examples were obtained by Sir John Kirk. The paper is prefaced by some valuable remarks by the collector. A new genus of Cyprinoids from Lake Nyassa is characterized as *Pelotrophus*.

8. Dr. H. Dohrn's List of the Land and Freshwater Shells of the Zambesi and Lake Nyassa collected by Sir John Kirk, published in the Society's 'Proceedings' for 1865 (p. 231).

Twenty-four species are noticed in this list by Dr. Dohrn, of which 7 are described as new.

9. The collection submitted by Sir John Kirk to Dr. Dohrn did not include the *Unionidæ*. The specimens of this group were sent to Mr. Isaac Lea of Philadelphia, a well-known specialist on this group of Mollusks. Lea referred Sir John Kirk's specimens to six species, all of which he described as new in a paper read before the Academy of Natural Sciences of Philadelphia in April 1864[1].

10. In Dr. Günther's "Contribution to the Knowledge of Snakes of Tropical Africa," published in the 'Annals and Magazine of Natural History' for 1888 (ser. 6, vol. i. p. 322), several species are described from the Nyassa district, but the names of the collectors are not recorded. The paper concludes with a list of 46 species of Snakes known to inhabit the Central Lake district of Tropical Africa.

11. Mr. Edgar Smith's paper on the Shells of Lake Nyassa, published in our 'Proceedings' for 1887 (p. 712).

This was based principally upon specimens collected by Mr. F. A. Simons.

12. Mr. R. Crawshay's valuable notes on the Antelopes of Nyassa-land, which was read at our meeting on the 2nd of December last[2].

Mr. Crawshay's list of the Antelopes of Nyassa-land contains 12 species, but others no doubt, particularly among the smaller forms, remain to be added to it.

This is positively the only information yet published on the Mammals of the Nyassa Basin.

These are the principal publications relating to the fauna of Nyassa-land that I am acquainted with. There are no doubt many others which will be mentioned by the various naturalists who will kindly contribute towards our information on this subject on the present occasion. As I said before, Nyassa-land, so far as we at

[1] See Proc. Acad. Nat. Sci. Philad. 1864, p. 108.

[2] See P. Z. S. 1890, p. 648.

present know it, appears to be best divisible into three sections for faunistic purposes; these are:—

1. *The Basin of the Shiré* below the cataracts, the fauna of which is probably indentical with that of the Lower Zambesi. Katunga, where the navigation of the Shiré ends, is about 500 feet above the sea-level.

2. *The Shiré Highlands*, in parts of which the hills run up to an elevation of 8000 feet, and where we should accordingly expect to find a considerable modification of the fauna.

3. *The Basin of Lake Nyassa*, where the lake itself lies at an elevation of about 1500 feet above the sea-level. The adjoining ranges on the western side, which is alone in British territory, will probably be found to possess a fauna nearly allied to that of the Shiré Highlands.

Mr. G. A. Boulenger then read the following paper "On the State of our Knowledge of the Reptiles and Batrachians of British Central Africa."

As may well be expected, our information respecting the herpetological fauna of this district is at present very meagre. The only specimens with precise localities in the British Museum are derived from five sources, viz.:—(1) 15 specimens from the Shiré Valley, purchased in 1864; (2) 11 specimens from the Blantyre Mission Station, on the Shiré highlands, and Lake Nyassa, collected by Mr. F. A. Simons, purchased in 1877; (3) 5 specimens from Lake Nyassa, collected by Mr. J. B. Thelwall, purchased in 1877; (4) 5 specimens from Lake Nyassa, purchased of Mr. Cutter in 1877; (5) 7 specimens from Lake Nyassa, purchased of the Universities' Mission in 1888.

Most of the Snakes have been noticed by Dr. Günther in a recent paper on the Snakes of Tropical Africa (Ann. & Mag. N. H. [6] i. 1888, p. 322), in which two new species from Lake Nyassa and one from the Shiré are described, and most of the Lizards and Batrachians will be found mentioned in the British Museum Catalogues (1882–1887). There are in addition a number of specimens in the Museum which are labelled "Zambesi," or "Zambesi Expedition," from Sir J. Kirk's collections, many of which were procured in the district with which we are at present dealing. A report on these Reptiles was published by Dr. Günther in the 'Proceedings' of this Society for 1864 (p. 303). Owing to the absence of precise information as to localities, I have abstained from mentioning them in the list appended to this communication. Other works of special importance in the study of this fauna are Peters's 'Reise nach Mossambique,' vol. iii. Reptiles, 1882, and Bocage's numerous papers in the "Jornal de Sciencias" of the Academy of Lisbon. No doubt many of the Reptiles described from the Portuguese possessions of South-west Africa will eventually be rediscovered to the East, our knowledge being already sufficiently advanced to show in a striking manner the homogeneity of the herpetological fauna of Southern tropical Africa.

In the following list I have enumerated all the Reptiles and Batrachians of British Central Africa of which specimens with localities are preserved in the British Museum.

LIZARDS.

1. Hemidactylus mabouia, Mor.; Cat. Liz. i. p. 122.
Shiré Valley.

2. Pachydactylus oshaughnessyi, Blgr.; Cat. Liz. i. p. 204, pl. xvi. fig. 3.
Lake Nyassa (*Thelwall*; *Simons*).

3. Varanus albigularis, Daud.; Cat. Liz. ii. p. 308.
Lake Nyassa.

4. Monopeltis sphenorhynchus, Ptrs.; Cat. Liz. ii. p. 455.
Shiré Valley.

5. Nucras tessellata, Smith; Cat. Liz. iii. p. 52.
Lake Nyassa.

6. Lygosoma sundevalli, Smith; Cat. Liz. iii. p. 307.
Lake Nyassa (*Thelwall*).

7. Ablepharus wahlbergi, Smith; Cat. Liz. iii. p. 350.
Lake Nyassa (*Thelwall*).

SNAKES.

8. Typhlops obtusus, Ptrs.

Typhlops obtusus, Peters, Mon. Berl. Ac. 1865, p. 260, pl.—. fig. 2, and Reise n. Mossamb. iii. p. 95 (1882).
Shiré Valley.

9. Simocephalus nyassæ, Gthr.

Simocephalus nyassæ, Günther, Ann. & Mag. N. H. (6) i. 1888, p. 328.
Lake Nyassa.

10. Prosymna ambigua, Bocage.

Prosymna ambigua, Bocage, Jorn. Sc. Lisb. iv. 1873, p. 218.
Shiré Valley.

11. Chlorophis irregularis, Leach.

Ahætulla irregularis, Günth. Cat. Col. Sn. p. 152 (1858).
Philothamnus irregularis, Bocage, Jorn. Sc. Lisb. ix. 1882, p. 4.
Ahætulla shirana, Günth. Ann. & Mag. N. H. (6) i. 1888, p. 326.
Shiré Valley, Blantyre Mission Station (*Simons*).

12. Philothamnus semivariegatus, Smith.

Ahætulla semivariegata, Günth. Proc. Zool. Soc. 1864, p. 307.

Philothamnus punctatus, Peters, Mon. Berl. Ac. 1866, p. 889, and Reise n. Mossamb. iii. p. 129, pl. xix. A. fig. 1 (1882); Bocage, l. c. p. 14.

Shiré Valley (*Kirk*); L. Nyassa (*Universities' Mission*).

13. Amphiophis[1] nototænia.

Coronella nototænia, Günth. Proc. Zool. Soc. 1864, p. 309, pl. xxvi. fig. 1, and Ann. & Mag. N. H. (6) i. 1888, p. 333.

Ablabes hildebrandtii, Peters, Mon. Berl. Ac. 1878, p. 205, pl. ii. fig. 6; Fischer, Jahrb. Hamb. Wiss. Anst. i. 1884, p. 7.

Tachymenis nototænia, Peters, Reise n. Mossamb. iii. p. 118 (1882).

Lake Nyassa (*Thelwall*); Cape McLear, L. Nyassa (*Simons*).

14. Psammophis sibilans, L., var. subtæniata, Peters.

Psammophis sibilans, var. *subtæniata*, Peters, Reise n. Mossamb. iii. p. 121 (1882); Fischer, Jahrb. Hamb. Wiss. Anst. i. 1884, p. 12.

Cape McLear, Lake Nyassa (*Simons*); L. Nyassa (*Universities' Mission*).

15. Psammophis angolensis.

Amphiophis angolensis, Bocage, Jorn. Sc. Lisb. iv. 1872, p. 82; Peters, Sitzb. Ges. naturf. Fr. 1881, p. 149.

Ablabes homeyeri, Peters, Mon. Berl. Ac. 1877, p. 620.

Dromophis angolensis, Boettg. Ber. Senck. Ges. 1888, p. 55.

Cape McLear, Lake Nyassa (*Simons*).

16. Thelotornis kirtlandi, Hallow.

Thelotornis kirtlandii, Peters, op. cit. p. 131, pl. xix. fig. 2.

Lake Nyassa (*Universities' Mission*).

17. Leptodira semiannulata, Gthr.

Leptodira semiannulata, Günth. Ann. & Mag. N. H (4) ix. 1872, p. 31.

Lake Nyassa (*Universities' Mission*).

18. Calamelaps miolepis, Gthr.

Calamelaps miolepis, Günth. Ann. & Mag. N. H. (6) i. 1888, p. 323.

Cape McLear, L. Nyassa (*Simons*).

[1] *Amphiophis*, Smith, is closely allied to *Psammophylax*. Twelve subequal maxillary teeth, followed by an enlarged, grooved tooth; mandibular teeth subequal. Nasal semidivided; frontal narrow. Eye moderate, with round pupil. Scales smooth, with apical pits. Ventrals rounded. Tail moderate; subcaudals in two rows.

19. Uriechis capensis, Smith.

Elapomorphus capensis, Smith, Ill. Zool. S. Afr., Rept., App. p. 16 (1849).
Uriechis capensis, Jan, Icon. Gén. Ophid. livr. 15, pl. i. fig. 5 (1866); Peters, Reise n. Mossamb. iii. p. 112 (1882); Günth. Ann. & Mag. N. H. (6) i. 1888, p. 324.
Cape McLear, L. Nyassa (*Simons*).

20. Uriechis lunulata, Ptrs.

Uriechis lunulatus, Peters, Mon. Berl. Ac. 1854, p. 623, & op. cit. p. 113, pl. xviii. fig. 2; Günth. l. c. p. 324.
Lake Nyassa.

21. Naia haie, L.

Naia haie, Peters, Reise n. Mossamb. iii. p. 137 (1882).
Shiré Valley.

22. Naia nigricollis, Reinh.

Naia nigricollis, Reinh. Dansk. Vid. Selsk. x. 1843, p. 269, pl. iii. figs. 5–7; Peters, op. cit. p. 138, pl. xx. figs. 9 & 10.
Naia mossambica, Peters, Mon. Berl. Ac. 1854, p. 625.
Shiré Valley.

23. Atractaspis rostrata, Gthr.

Atractaspis rostrata, Günth. Ann. & Mag. N. H. (4) i. 1868, p. 429, pl. xix. fig. J.
A. bibronii (*non* Smith), Peters, op. cit. p. 142, pl. xix. a. fig. 3.
Lake Nyassa (*Universities' Mission*).

24. Causus rhombeatus, Licht.

Causus rhombeatus, Peters, op. cit. p. 144.
Blantyre Mission Station (*Simons*).

BATRACHIANS.

25. Rappia concolor, Hallow.; Cat. Batr. Ecaud. p. 124.
Shiré Valley.

26. Megalixalus fornasinii, Bianc.; Cat. Batr. Ecaud. p. 130.
Shiré Valley; Lake Nyassa.

27. Hylambates maculatus, A. Dum.; Cat. Batr. Ecaud. p. 134.
Shiré Valley.

28. Phrynomantis bifasciata, Smith; Cat. Batr. Ecaud. p. 172.
Shiré Valley.

29. BREVICEPS VERRUCOSUS, Rapp; Cat. Batr. Ecaud. p. 177.
Lake Nyassa (*Universities' Mission*).

Mr. EDGAR A. SMITH offered the following remarks on the Molluscan Fauna of British Central Africa:—

So far as I can ascertain, very little seems to be known of the Mollusca of this region, and it is only that part of the country near Lake Nyassa and the lake itself which have been partially investigated. Sir John Kirk was the first to collect in this district, and the specimens he obtained were described by Dr. Dohrn in the 'Proceedings' of this Society for 1865, and by Isaac Lea in the Proc. Acad. Nat. Sci. Philad. for 1864. Some years later Mr. F. A. Simons visited Nyassa and brought home a number of new forms from the lake, which I described in the 'Proceedings' of this Society for 1877. Finally M. Victor Giraud, whilst travelling in the Lake region, also made collections of shells from Nyassa, which were reported upon by M. Bourguignat[1] in 1889. These were obtained at the northern end of the lake, whilst those collected by Sir John Kirk and Mr. Simons were from the southern extremity.

Judging from what we know of the Mollusca of that part of Africa which lies to the east and south of this district, I do not anticipate that many very remarkable forms will be discovered. Doubtless interesting intermediate links connecting some of the large species of *Achatina* may be met with, and a number of new species of other groups of Helicidæ, besides a few forms of freshwater shells, will be found. It is to be hoped, however, that these conjectures may prove incorrect, and that future investigators will be rewarded by the discovery of many, not only new and interesting specific, but also generic forms.

In Capello and Ivens's work 'De Angola á Contra-Costa,' a number of species collected by those travellers has been enumerated by A. Furtado. Although obtained to the south of British Territory, some of them have already been recorded from the Nyassa region; and it is therefore probable that others, eventually, will also be found to range as far northward.

In the following list none of the so-called species characterized by M. Bourguignat are quoted, because, in my opinion, most of them, if not all, are merely varieties of those previously described.

LIST OF THE KNOWN SPECIES OF MOLLUSCA FROM LAKE NYASSA.

1. *Limnæa natalensis*, Krauss.
2. *Physa nyassana*, Smith.
3. —— *succinoides*, Smith.
4. *Physopsis africana*, Krauss.

[1] Bull. Soc. Mal. France, 1889, pp. 1–40.

5. *Viviparus politus*, Frauenfeld. } ? Modifications of one species.
6. —— *jeffreysi*, Frauenfeld.
7. —— *capillatus*, Frauenfeld.
8. —— *robertsoni*, Frauenfeld.
9. *Bythinia stanleyi*, Smith.
10. *Lanistes affinis*, Smith.
11. —— *solidus*, Smith.
12. —— *ovum*, Peters.
13. —— *purpureus*, Jonas.
14. —— *nyassanus*, Dohrn.
15. *Melania tuberculata*, Müller.
16. —— *nodicincta*, Dohrn.
17. —— *simonsi*, Smith. } ? Modifications of one species.
18. —— *polymorpha*, Smith.
19. —— *turritispira*, Smith.
20. —— *pupiformis*, Smith.
21. —— *nyassana*, Smith.
22. *Corbicula radiata*, Parreyss.
23. —— *astartina*, Martens.
24. *Unio nyassaensis*, Lea.
25. *Spatha alata*, Lea.
26. —— *nyassaensis*, Lea.

Examples of the following species of Land-Shells were obtained by Sir John Kirk, as quoted by Dohrn:—

1. *Helix mosambicensis*, Pfeiffer.
2. *Streptaxis kirkii*, Dohrn.
3. *Ennea lævigata*, Dohrn.
4. *Achatina lamarckiana*, Pfr.
5. —— *panthera*, Férus.
6. *Buliminus stictus*, Martens.
7. —— *catenatus*, Martens.
8. *Cyclostoma calcareum*, Sowerby.

A communication was then read from Mr. E. T. Newton, F.Z.S., containing the following "Notes on the Geology of British Central Africa":—

Although so little is definitely known of the Geology of Nyassaland, that it may almost be said to be a *new* field for geological exploration, yet we are not altogether without information as to some points of its general structure.

Livingstone did not neglect the rocks over which he travelled, and some scattered geological information may be found in his 'Missionary Travels' concerning regions bordering on "British Central Africa."

Additional facts of no little value were made known by Mr. James Stewart, C.E., in the Report of his journey on the western shores of Lake Nyassa, read before the Geographical Society (Proc. R. Geogr. Soc. vol. iii. 1881, p. 264).

The fullest and most interesting account of the Geology of the Nyassa country is that given by Prof. Henry Drummond as "a Geological Sketch" in chapter viii. of his 'Tropical Africa,' published in 1881. This sketch embraces the whole of the country he traversed from the mouth of the Zambesi to the Tanganyika Plateau. A coloured map accompanying this sketch serves to indicate in a general way the positions of the rocks that have been recorded by others, or directly observed by Prof. Drummond himself. In this chapter the fossil Fishes found by the author are described in detail by Dr. R. H. Traquair.

Quite recently Prof. Rupert Jones (Geol. Mag., Dec. 1890) has given an account of the coal and the fossil shells which have been found near the N.W. extremity of Lake Nyassa.

Starting from the mouth of the Zambesi, at a distance of about 50 miles from the coast, there is, according to Prof. Drummond, an ancient Coral-reef, which, although standing only a few feet above the sea-level, probably indicates a slight elevation of this part of the coast.

About 20 miles further inland near Shupanga, and still only at a very slight elevation, sedimentary rocks were met with consisting of "a few thin beds of red and yellow sandstones and fine conglomerates." No fossils were found; but these deposits are believed to be of the same age as the beds at the Cape, which are known as the Karoo formation (Lowest Mesozoic), which seems to extend as far north as Zanzibar and Mombasa.

Beds of coal are said to occur far up the Zambesi, at a place called Tete, and are probably associated with beds of the Karoo age, which it is thought will be found to form a narrow belt fringing the plateau of the interior.

A little above the junction of the Shiré River and the Zambesi, the first hills of the plateau begin; they vary in height from 100 or 200 feet to 2000 feet, and those examined by Prof. Drummond "consisted entirely of white quartzite," the only quartzite he saw in Central Africa. At the foot of one of these hills (Morumballa) there is a hot spring, described by Livingstone.

Livingstone spoke of coal occurring about 2 or 3 days' journey N.W. of Morumballa, but Prof. Drummond, after careful search, could find no trace of coal in the neighbourhood, and is of opinion that a black rock (very dark diorite) which does occur, and in the distance looks very like coal, must have misled Livingstone.

The great African Plateau, including the upper part of the Shiré River and the greater part of the country surrounding the Nyassa Lake, as well as half the plateau between the Nyassa and the Tanganyika, consists almost wholly of *granite* and *gneiss*; the character of the rocks being remarkably uniform throughout the area.

Volcanic rocks occur at several places along the Zambesi and also at the northern end of the Nyassa.

About six miles S. by E. of Mount Waller, on the N.W. shore of Lake Nyassa, Mr. James Stewart noticed some *coal* occurring about a mile and a half from the Lake shore and about 500 feet above its level. His report of this coal was very favourable, as it made a good fire and burned up strongly. Prof. Drummond, however, who seems to have examined the same bed, at the same place, is much less satisfied with the coal *he* tried, and did not think it of much economic value.

Mount Waller, which rises some 3100 feet above the lake, was visited by Mr. Stewart, and found to consist of horizontal argillaceous and sandy beds, of varying degrees of hardness—three bands of coarse grit forming a broad ledge along the mountain side at an elevation of about 1200 feet.

Not far from the village of Karongo, at the N.W. extremity of Lake Nyassa, Prof. Drummond met with a series of sedimentary deposits, some of which are fossiliferous. These he believes to be continuous with the coal-bearing series near Mount Waller, although situated about 60 miles further to the north-west.

The fossils found are of much interest, being the first recorded from Central Africa. They consist of some fragmentary fish-remains and some shells. The fishes have been described by Dr. R. H. Traquair as *Acrolepis ? drummondi* and *A. africanus*; while the mollusks have been named by Prof. T. Rupert Jones *Iridina oblonga*.

From these fossils it is evident that the deposits are closely related to the Karoo formation, which is so well known further south on account of the *Dicynodon* and other remarkable reptilian remains which it has yielded.

Remarks were also made by Dr. A. Günther on the Fishes, by Mr. O. Thomas on the Mammals, by Mr. Stebbing on the Crustaceans, by Mr. Salvin on the Butterflies, and by Mr. Beddard on the Earthworms of British Central Africa.

The following papers were read :—

1. Description of a new Pigeon of the Genus *Carpophaga*. By the Hon. WALTER ROTHSCHILD, F.Z.S.

[Received April 10, 1891.]

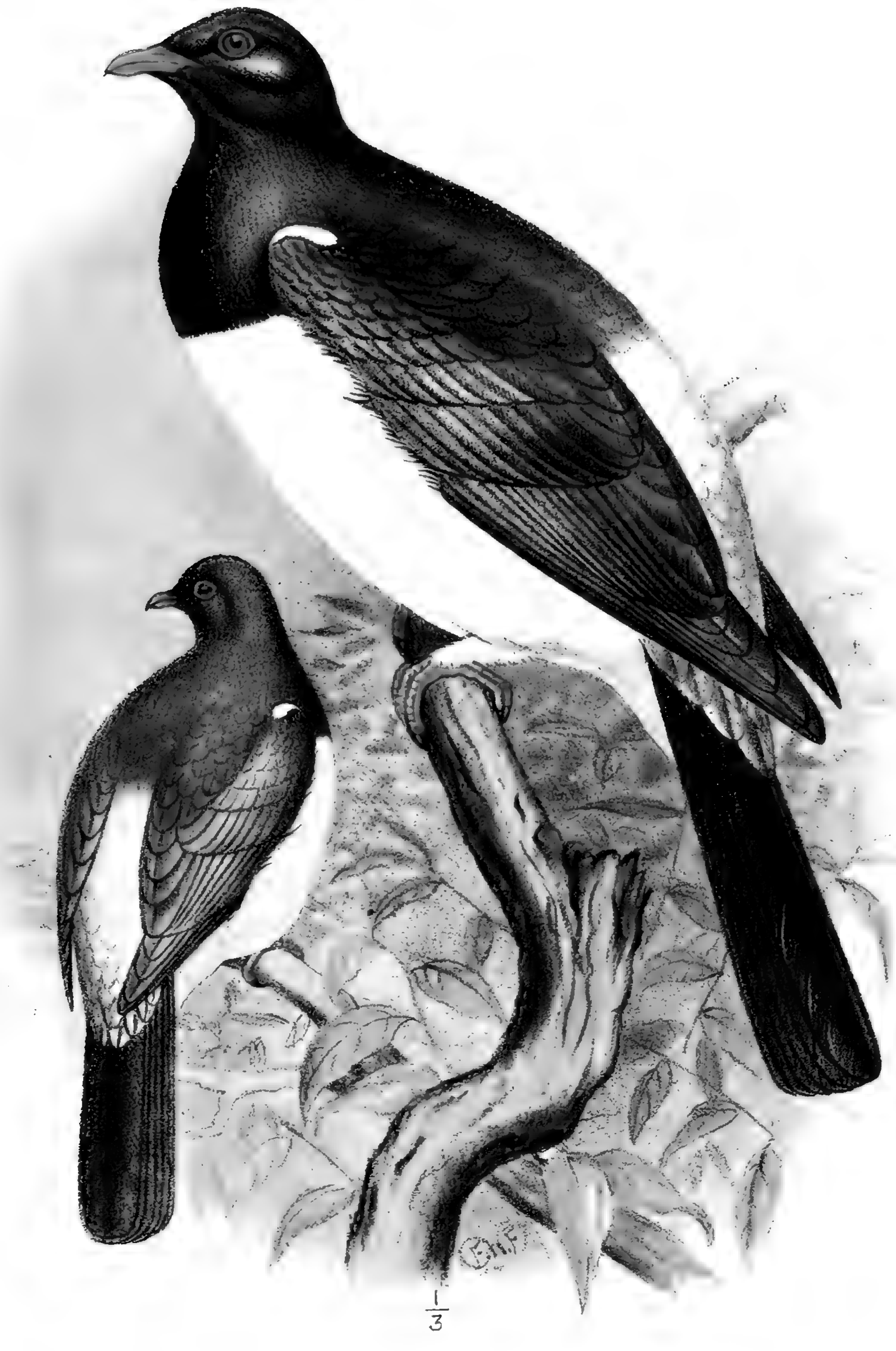
(Plate XXVIII.)

The Pigeon described below was sent from the Chatham Islands by my collector Henry Palmer.

This Pigeon, which at Professor Newton's suggestion I propose to call *Carpophaga chathamensis*, is very closely allied to the *Carpophaga* of New Zealand, *Carpophaga novæ zealandiæ*, but can be at once distinguished from it not only by the very considerable differences in colour, but also by its much larger size and larger beak.

CARPOPHAGA CHATHAMENSIS, sp. nov. (Plate XXVIII.)

Adult male. Head, neck, and fore part of breast deep brownish



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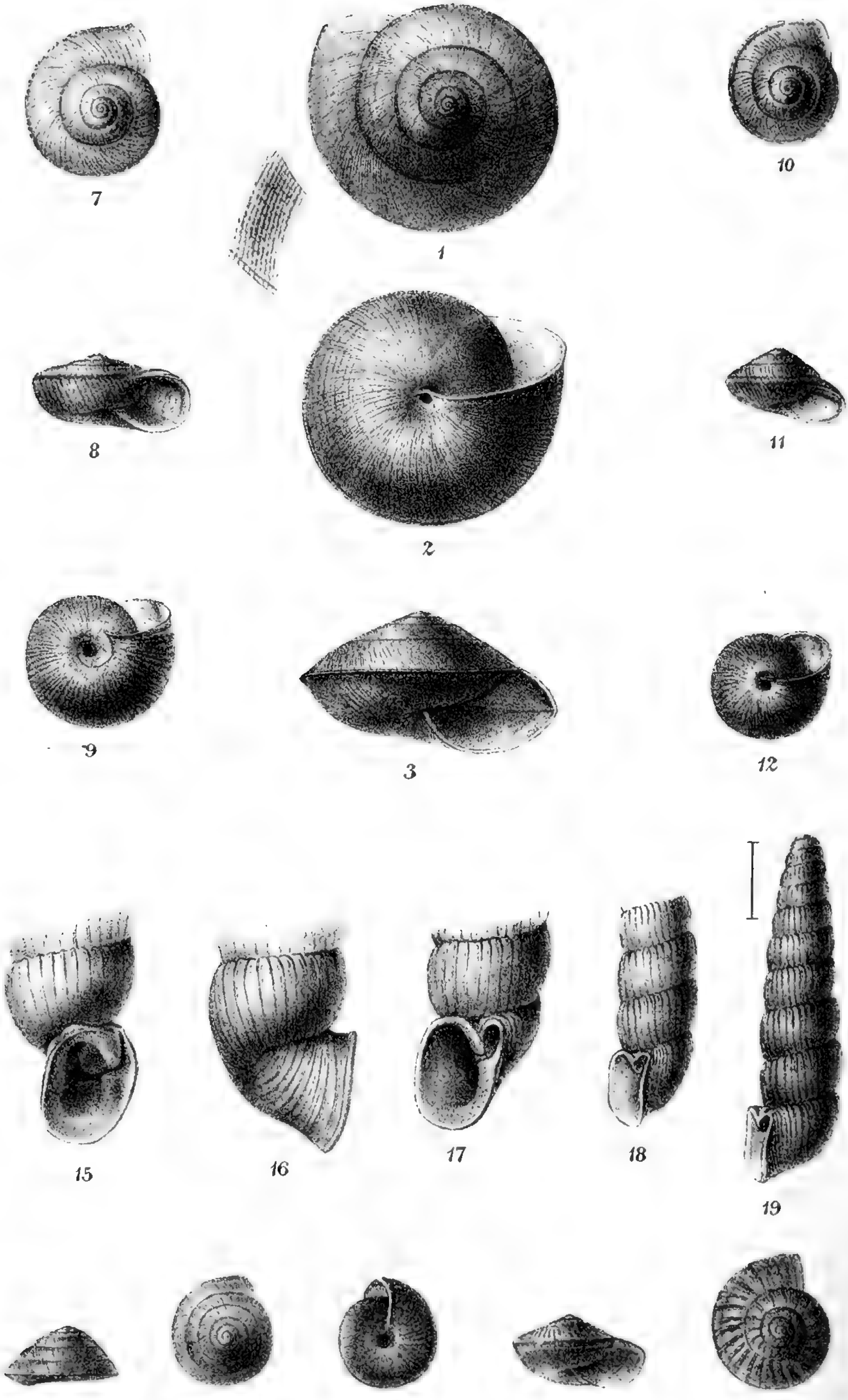
F.W. Frohawk del et lith.

West, Newman chromo.

Carpophaga chathamensis.



Geo. West & Sons del. lith et imp.

NEW INDIAN LAND SHELLS.

purple, with a faint olive-green reflexion; shoulders, back, and wing up to carpal joint brownish copper-colour, merging into greenish grey on the back. Lower part of back and rump pale silvery grey. Quills and their coverts pale grey, with a greenish light on the coverts; inner webs grey; tail-feathers steel-blue, without the greyish terminal band so conspicuous in *Carpophaga novæ zealandiæ*: under surface of tail-feathers dark grey-brown in their apical portion. Underparts from breast downwards pure white, without the yellowish tail-coverts found in the allied species; linings of wings grey. Irides and feet crimson; bill deep orange at base, yellow at tip; eyelids yellow.

Total length 22 inches, extent of wings 34 inches, wing from flexure 11 inches, tail $8\frac{1}{2}$ inches; bill along ridge 1 inch, along edge of lower mandible $1\frac{1}{2}$ inch; middle toe and claw $2\frac{1}{4}$ inches.

Adult female. Similar to male.

Hab. Chatham Islands, South Pacific.

The collection contained nine specimens, which exhibit no variation.

2. Descriptions of some new Land-Shells from the Indian Region. By Col. R. H. Beddome.

[Received May 2, 1891.]

(Plate XXIX.)

Nanina subcastor, sp. nov. (Plate XXIX. figs. 1–3.)

Shell perforate, depressed, carinate, reddish brown, above obliquely and finely striated, the striæ being very indistinctly decussated by spiral lines; spire scarcely raised, nearly convex, depressedly conoid; whorls $5\frac{1}{2}$, very gradually increasing, the last not descending, slightly convex above, moderately swollen beneath, where the decussation is more distinct than on the upper surface, sharply angled at the periphery; aperture oblique, angulately lunate, broader than high; peristome very little thickened, a thin callus joining the margins, reflected at the small punctiform umbilicus. Diameter $1\frac{1}{4}$–$1\frac{1}{2}$ inch; height $\frac{5}{8}$ inch.

Hab. The Myhendra Hill, South Travancore, at about 2500 feet elevation.

The shape of this shell is almost the same as that of *Nanina castor*, a Khasyan species, but the sculpture is quite different; the drawing of the Papuan *Nanina tritoniensis* in Tapparone-Canefri's work [1] is also exceedingly like it, only a little more depressed and with a sharper angle at the periphery. It belongs, I think, to the section *Rhysota*.

Macrochlamys peringundensis, sp. nov. (Plate XXIX. figs. 13, 14.)

Shell thin, horny, shining, yellowish brown, plicated; umbilicus small; spire depressed subconical, apex obtuse, sutures prominent;

[1] Ann. Mus. Civ. Genova, ser. 2, iv. p. 150, pl. i. figs. 18–20.

whorls 6, convex, gradually increasing, all the whorls plicated, but the plications on the last not reaching the periphery, the upper surface of the last whorl sometimes furnished with two thin, whitish, concentric lines, one near the periphery, the other near the suture, sometimes very indistinct or altogether absent; periphery bluntly angled, with sometimes a second less prominent ridge below it; aperture nearly vertical, lunate. Diameter $\frac{5}{8}$ inch, height $\frac{5}{16}$ inch.

Hab. Near the summit of the Peringunda Hill, on the Coimbatore side of the Anamallays, at about 5000 feet elevation, in moist woods.

Nearly allied to the Khasyan *M. plicifera*, Blanford, but a smaller shell, less plicated, and with a shining epidermis. Type in the Natural History Museum, South Kensington.

TROCHOMORPHA SUBNIGRITELLA, sp. nov. (Plate XXIX. figs. 4, 5, 6.)

Shell moderately umbilicate, depressedly turbinate, quite rounded at the apex; whorls 6, very gradually increasing, faintly striated, the last sharply angled at the periphery, nearly flat on the underside; aperture oblique, subquadrate; peristome simple, the margins distant; colour a rich dark brown, shining below. Diameter $\frac{1}{2}$ inch, height $\frac{5}{16}$ inch.

Hab. Andaman Islands (*Dr. Hungerford*).

This species recalls the Pacific forms of the genus rather than the Indian ones, its nearest ally being *T. nigritella*, which, however, is a larger shell with the last whorl much broader. Type in the Natural History Museum.

HELIX COLLETTI, sp. nov. (Plate XXIX. figs. 7, 8, 9.)

Shell openly umbilicate, orbiculato-depressed, rather thin; spire nearly flat; whorls 5, the last obsoletely angulate at the periphery, not descending, very prominently and coarsely striated obliquely; colour light fawn, with a dark band at the periphery; aperture somewhat oblique, lunately suborbicular; peristome simple, very slightly reflexed, margins not joined. Diameter $\frac{3}{4}$ inch, height $\frac{3}{8}$ inch, width of umbilicus 5 mill.

Hab. The Shan States, Upper Burma.

Examples of this species were collected for Dr. Hungerford by Mr. Boxall, who accompanied Col. Collett's expedition. It belongs to the section *Planispira*, Beck, being allied to *H. fallaciosa*, the sculpture is very similar to that of *H. gobanzi*. Type in the Natural History Museum.

HELIX SHANICA, sp. nov. (Plate XXIX. figs. 10, 11, 12.)

Shell narrowly umbilicate, depressedly turbinate, rather solid; whorls 5, gradually increasing, rather convex, the last subangulate at the periphery, slightly descending towards the mouth, all furnished with a fine oblique striation, more prominent on the last whorl; colour a light fawn, darker at the apex of the shell and near the mouth, a narrow dark band just above the periphery; aperture oblique, rotundately lunar; peristome slightly reflexed, dark fawn-coloured, the margins distinct. Diameter $\frac{9}{16}$ inch, height $\frac{3}{8}$ inch.

Hab. The Shan States, Upper Burma.

Also collected for Dr. Hungerford by Mr. Boxall. Referable to the section *Planispira*. Type in the Natural History Museum.

ENNEA (HUTTONELLA) SEATONI, sp. nov. (Plate XXIX. figs. 15–19.)

Shell cylindric, whitish, narrowly rimate; whorls 11, convex, sutures deep, very slightly decreasing in size upwards, the upper two smooth, shining, the others finely but prominently ribbed, the last expanded and free towards the aperture; aperture oval, nearly vertical; peristome thickened inwards, the columellar margin with a deep circular incision extending to the suture of the penultimate whorl, above this cavity the margin of the peristome runs back into the interior of the aperture, forming a strongly developed lamella, opposite which there are two obscure teeth on the inner part of the peristome well within the aperture. Length $\frac{3}{8}$ inch.

Hab. Tenasserim, limestone rocks east of the Mooley-it mountain near the Siam frontier.

Only a single example was found when visiting this mountain with Col. Seaton, the Conservator of Forests for the Tenasserim provinces. Its nearest ally is *Ennea cylindroidea*, Stoliczka, which is, however, a much smaller shell.

DESCRIPTION OF PLATE XXIX.

Figs. 1, 2, 3. *Nanina subcastor*, p. 313.
4, 5, 6. *Trochomorpha subnigritella*, p. 314.
7, 8, 9. *Helix colletti*, p. 314.
10, 11, 12. *Helix shanica*, p. 314.
13, 14. *Macrochlamys peringundensis*, p. 313.
15, 16, 17, 18, 19. *Ennea* (*Huttonella*) *seatoni*, p. 315.

3. On the Fossil Remains of Species of the Family *Giraffidæ*. By Dr. C. J. FORSYTH MAJOR[1].

By far the most numerous remains met with in the fossiliferous deposit of Samos explored by me in 1888 and 1889 appertain to a new member of the family Giraffidæ. The rich materials at my command furnish satisfactory knowledge of this new form, and at the same time suggest novel considerations concerning the various forms already described.

Falconer and Cautley, in describing a fossil Giraffe discovered in the Siwaliks, wrote as follows:—"The Giraffe has hitherto been confined to a single species, and has occupied an isolated position in the order to which it belongs. It may be expected that, when the ossiferous beds of Asia and Africa are better known, other intermediate forms will be found, filling up the wide interval which now separates the Giraffe from the antlered ruminants, its nearest allies in the order according to Cuvier and Owen"[2]. This was written 47 years ago.

[1] Communicated by the President.

[2] H. Falconer and Capt. P. T. Cautley, "On some Fossil Remains of *Anoplotherium* and Giraffe, from the Sewalik Hills," Proc. Geol. Soc. Lond. no. 98, 1844.

We shall consider on the present occasion how far the prediction has been fulfilled, and see at the same time that the authors of the 'Fauna Antiqua Sivalensis' have themselves contributed to realize their anticipation.

1. Giraffa.

First, as to the forms ascribed to the genus *Giraffa* itself. There is one species which for nearly 50 years has haunted palæontological papers, from which it is high time that it should disappear. This is the *Giraffa* (*Camelopardalis*) *biturigum*, Duv., said to come from a Tertiary deposit at Issoudun near Lyons[1]. Anyone who examines with a little attention this supposed fossil, now preserved in the Museum of the Jardin des Plantes, may perceive at once that we have before us no fossil whatever, but the mandibular ramus of a recent specimen of *Giraffa camelopardalis*. It was found at the bottom of a dry well in the courtyard of a house belonging to a chemist, and it seems to have found its way from the apothecary's shop to the place where it was discovered, in order to render it more valuable.

Besides this spurious fossil, half a dozen Tertiary forms have been ascribed to the genus *Giraffa*. The family is beyond doubt; but though we cannot for the moment assign them to any other genus than *Giraffa*, this reference ought, in my opinion, to be considered as provisional. In Palæontology, even when we assign a generic name to some form imperfectly represented, it is with the reserve, though sometimes unexpressed, that more complete finds will modify the original opinion.

The form which appears to have the best claims to rank as a species of the genus *Giraffa* is the *Giraffa sivalensis* (Falc. & Cautl.), with which we have been made more thoroughly acquainted by Lydekker's description[2], founded both on teeth and bones, and leading to the conclusion that the Siwalik Giraffes were constructed on the same plan as the living species. Even in this case I would not be too positive as to the genus, the skull being unknown, and the reference of the bones and teeth to one and the same form, though very probable, not being beyond all doubt.

[1] Duvernoy, "Sur une mâchoire de girafe fossile découverte à Issoudun (dép. de l'Indre)," Notes communiquées à l'Acad. des Sciences, séances du 15 mai et du 27 novembre 1844; id. Ann. Sc. Nat. 3e série, t. i. p. 136, pl. 2 (1843). See also on the same subject:—

H. Falconer and P. T. Cautley, "On some Fossil Remains of *Anoplotherium* and Giraffe, from the Sewalik Hills," Proc. Geol. Soc. of London, no. 98, 1844, postscript.—Blainville, 'Ostéographie,' Atlas, Genre *Camelopardalis*, pl. ii. (*Camelopardalis biturigum*).—Gervais, 'Zoologie et Paléontologie franç.,' deux. éd., Paris, 1859, p. 142.—A. Gaudry, 'Comptes Rendus de l'Académie des Sciences,' vol. xl. p. 802; séance du 26 novembre, 1860.—R. Owen, 'Palæontology,' 2nd edit., Edinburgh, 1861, p. 409.—A. Gaudry, 'Animaux fossiles et Géologie de l'Attique,' Paris, 1862, pp. 249, 250.—L. Rütimeyer, "Beiträge zu einer natürl. Geschichte der Hirsche," Abh. d. schweiz. paläontol. Gesellsch. vol. viii. Erster Theil, p. 73 (Zürich, 1881).—R. Lydekker, Mem. Geol. Survey of India, ser. x. Indian Tert. and Post-tert. Vertebr. vol. ii. pp. 102, 111 (Calcutta, 1884).

[2] R. Lydekker, *l. c.* vol. ii. pp. 103, 112.

The same remarks apply to the *Giraffa attica* (Gaud. et Lart.), from Pikermi, the limb-bones of which, the only parts known, approximate this form to the living species. Some molar teeth are also doubtfully referred to it. Gaudry himself, who described the remains, calls attention to the fact that, the cranium being unknown, no definite determination is possible [1].

Concerning the *Giraffa vetusta* (Wagner), founded on an incomplete maxillary from Pikermi [2], and the *Giraffa microdon* (Koken) from China, represented by a few molars [3], nothing more can be said than that the teeth are very Giraffe-like and closely approach those ascribed to the *Giraffa attica*.

Lastly, the *Giraffa parva* (Weithofer) from Pikermi [4] has been pronounced of late by its describer [5] to belong to a different genus, which we shall have to consider later.

2. Samotherium [6].

When the first remains of a large ruminant were brought to light by my Greek workmen at Samos, I believed I had found the *Helladotherium*, the large Giraffe-like ruminant discovered at Pikermi by Gaudry. The subsequent discovery of several skulls, all of them hornless, showed at once differences from *Helladotherium*. Two fragments of the frontal, each bearing a horn implanted directly above the roof of the orbit, were so different from what is known in existing Giraffes, as well as in Antelopes and Bovines, that I was not at the time able to classify them. The subsequent discovery, however, of the posterior part of the skull belonging to one of the frontals at once resolved the enigma in quite an unexpected manner, indicating a member of the Giraffidæ provided with horns, but in every other respect so closely identical with the hornless skulls just mentioned that both must evidently be considered as belonging to the same species, the hornless skulls doubtless representing the female sex. This is what I have called *Samotherium boissieri* [7]. Later on was found by me the nearly complete skull now in the British Museum, shown of one-sixth the natural size in the accompanying figure (p. 318).

[1] A. Gaudry, 'Animaux foss. et Géol. de l'Attique,' pp. 245–252.

[2] A. Wagner, "Nachträge zur Kenntniss der fossilen Hufthier-Ueberreste von Pikermi," Sitzungsb. der k. bayer. Akademie d. Wissensch. pp. 78–82, fig. 1 (Jahrg. 1861, Bd. ii., München).—K. A. Weithofer, "Beiträge z. Kenntniss der Fauna von Pikermi bei Athen," Beiträge zur Paläontologie Oesterreich-Ungarns (Bd. vi.), Wien, 1888, p. 284, Taf. xvii. (viii.) figs. 1, 2.

[3] E. Koken, "Fossile Säugethiere Chinas," Paläont. Abh. herausgeg. von Dames und Kayser, Bd. iii. Heft. 2, 1885, p. 61, Taf. iii. (viii.). figs. 13–15.

[4] A. Weithofer, "Beiträge zur Kenntniss der Fauna von Pikermi bei Athen," (*l. s. c.*) pp. 281–285, Taf. xvi. (vii.)

[5] A. Rodler und K. A. Weithofer, "Die Wiederkäuer der Fauna von Maragha," Abdruck aus dem lvii. Bande d. Denkschr. der mathem.-naturwiss. Classe der kais. Akademie der Wissensch. Wien, 1890, pp. 6, 10.

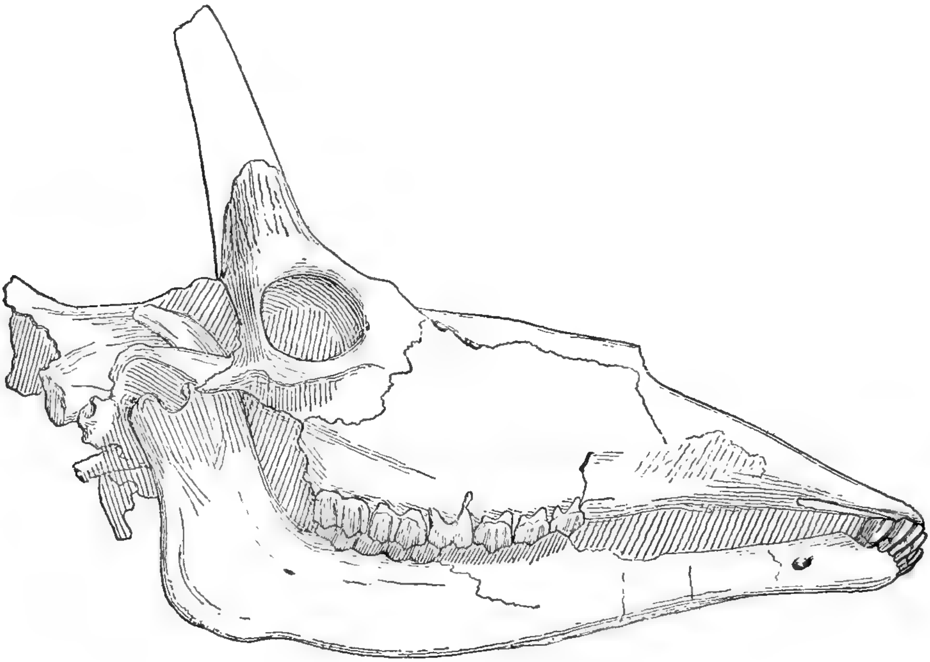
[6] Forsyth Major, "Sur un gisement d'ossements fossiles dans l'île de Samos, contemporains de l'âge de Pikermi," Comptes rendus de l'Académie des Sciences, Paris, séance du 31 déc., 1888.

[7] *Loc. cit.*

The principal difference from the skull of the living Giraffe, besides the absence of horns in a certain number of perfectly adult and even partially aged specimens, consists in the position occupied by the horns present in some other crania, these being placed, as already stated, on the very roof of the orbits, whilst in the living animal we see them, as is well known, far more backwards, viz. partly on the parietal and partly on the frontal bones.

First, as to the hornless skulls. Take away the protuberances and

Fig. 1.



Samotherium boissieri.
Side view of skull and mandible of male, one-sixth nat. size. Isle of Samos.

horns in a young skull of the Giraffe, and its affinity with the hornless skulls of *Samotherium* cannot be denied. In these last, as well as in the horned specimens, the superior profile stretches nearly horizontally from the upper part of the occiput towards the snout. The roof of the orbits being made somewhat tumid by pneumatic cavities, even in the hornless specimens, the region between them, occupied in the Giraffe by the so-called unpaired horn, appears hollowed. Another analogy of the superior profile, as well as of the upper contour of the skull of *Samotherium*, is with the skull of the female Elk, which last genus has been brought by Rütimeyer into close relation with the Giraffe[1].

[1] L. Rütimeyer, 'Beiträge zu einer natürlichen Geschichte der Hirsche,' i. pp. 58–72.

As regards the horns of *Samotherium*, I have to state an interesting fact. In the skull of an aged specimen of *Samotherium*, just above the orbits where the large horns are placed in the horned specimens, there occur very small processes separated by a suture from the underlying part of the frontal. It appears that we have before us the same sort of processes as in the living Giraffe. On examination of the large horned skull of the *Samotherium*, a sort of burr is visible on the anterior and interior base of the horn-cores, which apparently corresponds to the coalesced suture. The skull in which the small processes appear above the orbits is evidently that of an aged female, and I think the explanation to be given is that in aged individuals of the female sex, male characters occasionally make their appearance. Rütimeyer has recorded that in an aged female of the Giraffe a sort of stalactitic crust, as he terms it, corresponding to the dermal median process of the male, sometimes covers the medial "horn"[1].

I do not propose to enter here into any detail respecting the dentition and the limb-bones of the *Samotherium*. As to the first, it suffices to remark that the teeth differ from those of the Giraffe only in slight particulars. Whilst the limb-bones in their relative proportions come nearer to what is the rule amongst Ruminants, the few cervical vertebræ collected indicate that the *Samotherium* had a far less elongated neck than the Giraffe.

In the British Museum is preserved a portion of the skull from the ossiferous deposit of Maragha in Persia, which I have identified as the *Samotherium boissieri*. A similar remark may be made in reference to some remains from the same deposits, nearly complete as to the dentition, very imperfect as to the skull, lately described by Rodler and Weithofer under the name of *Alcicephalus neumayri*[2]. The skull being so incomplete, there still remains some doubt as to its *specific* identification with *Samotherium boissieri*.

3. Palæotragus.

A near ally of the *Samotherium* is a ruminant from Pikermi described by Gaudry as an Antelope under the name of *Palæotragus rouenii*[3], as a reference to the figure will at once show. Gaudry entertains some doubts as to the systematic position of *Palæotragus*; he defines it:—"Ruminant qui a des cornes comme les antilopes, quoiqu'il diffère de ces animaux par la plupart de ses caractères"[4]; and farther on, "Si je considère ses cornes, je le classe auprès des antilopes, mais je doute de ce rapprochement, quand je regarde ses molaires semblables à celles des cerfs et de la girafe, son occipital qui rappelle celui d'un âne, sa région pariétale allongée et rectangulaire," etc.[5]

Rütimeyer is less hesitating as to the place which *Palæotragus*

[1] Rütimeyer, *l. c.* p. 66, note.

[2] Rodler und Weithofer, 'Die Wiederkäuer der Fauna von Maragha,' pp. 2–9, Taf. i. fig. 1, Taf. ii., Taf. iii. figs. 1–6, Taf. iv. figs. 1–4.

[3] A. Gaudry, 'Animaux fossiles et Géol. de l'Attique,' pp. 264–267, pl. xlv.

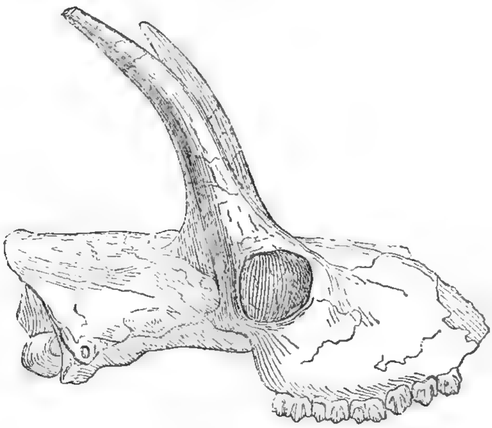
[4] *L. c.* p. 264.

[5] *L. c.* p. 267.

ought to occupy; he says—"Am zutreffendsten scheint *Palæotragus* in heutiger Sprache characterisirt zu sein, wenn man ihn als eine Form von *Aegoceros* (*Hippotragus*) mit noch brachyodontem Gebiss bezeichnen würde"[1].

The only resemblance with the Antelopes, and which seems to have been the reason for assigning to *Palæotragus* a place amongst them, is the position of the horns. Even this character does not quite agree; for I know no instance amongst Antelopes of the horns

Fig. 2.



Palæotragus roueni.

Side view of skull, one-sixth nat. size (after Gaudry). Pikermi, Attica.

being separated by such a large interval, owing to the enormous dilatation of the skull between the orbits, in which character *Palæotragus* agrees as well with the Giraffe as with *Samotherium*; and, moreover, with the latter in the horizontal upper profile of the cranium from the occiput to the snout. If it were not for the equine-like constriction of the occiput of *Palæotragus roueni*, as described by Gaudry, I should not have established a new genus for my Samos remains, but should have united *Samotherium* with *Palæotragus*, so very like are both in every other respect.

A hornless skull from Pikermi, described by Weithofer as *Camelopardalis parva*[2], may turn out to be the female form of the Giraffoid *Palæotragus*. Rodler and Weithofer have of late pronounced this form to belong doubtless to their new genus *Alcicephalus*[3]. This last being synonymous with *Samotherium*, there is no great difference in our respective opinions. The skull of *Camelopardalis parva* being rather incomplete and especially wanting the occipital region, it cannot for the present be decided whether its affinities are with *Samotherium* or with *Palæotragus*.

[1] L. Rütimeyer, "Die Rinder der Tertiär Epoche, nebst Vorstudien zu einer natürlichen Geschichte der Antilopen," Abh. d. schweizer. paläontol. Ges. vol. iv., Zurich, 1877, p. 83.

[2] *L. s. c.*

[3] Rodler and Weithofer, 'Die Wiederkäuer der Fauna von Maragha,' p. 10.

4. SIVATHERIUM; and 5. HYDASPITHERIUM [1].

As is well known, the Siwaliks have yielded the remains of *Sivatherium* and *Hydaspitherium*, about the relations of which there has been a good deal of discussion. I have to recall to mind that Dr. Murie placed the Sivathere in a distinct family, as showing affinities, in his opinion, with several distinct groups of ruminants, but being on the whole most nearly allied to *Antilocapra* [2]. These views as well as those of Rütimeyer have been opposed by Lydekker, who groups the Sivathere and its allies (*Hydaspitherium* and *Bramatherium*) in the same family as the Giraffe, basing his opinion especially on the similarity of the molar teeth, as well as on the transition in the bones of the limbs and neck from *Sivatherium* to the Giraffe, and on some other characters of minor importance [3].

I find it necessary to enter into some detail regarding the views propounded by Rütimeyer [4], who is most positive in his assertion as to *Hydaspitherium*, denying on the one hand that it has any relation whatever with the Giraffe, and on the other hand insisting strongly on its affinities with the *Damalis* group amongst the Antelopes. The form of the forehead, as well as the implantation of the horns, according to Rütimeyer correspond most of all with *Damalis* and *Alcelaphus*. The conformation of the occiput is said to find its nearest analogue in *Alcelaphus* and especially in *A. tora*. On the whole the structure of the cranium of *Hydaspitherium* is characterized as an abbreviation of the *Damalis* skull.

Even if we admit that in *Hydaspitherium* the parietal region be as narrow and as much displaced backwards as in some members of the *Damalis* group (*D. tora, caama*, &c.), there would be no sufficient grounds for referring it to these Antelopes, as this same extreme conformation is found not only in the skulls of some species of *Damalis*, but is characteristic besides of *Connochætes*, of several Bovines, and even of male adult skulls of some Ovines, such as *Ovis argali*, *O. polii*, and *O. nahoor*. There is a fossil form, too, found in Samos, *Criotherium*, in which the parietal region is also reduced to a very the narrow zone, behind and under the horn-cores; the distinctness, however, of this form from *Damalis* can be at once determined.

Moreover, the comparison of the *Hydaspitherium* skull with those of the *Damalis* seems to me unjustifiable for other reasons. Rütimeyer starts from the assumption that the parietal region begins in the *Hydaspitherium*, as is generally the case in Ruminants, nearly behind the horn-cores—in other words, that the horn-cores are limited to the

[1] I am obliged to postpone my remarks on *Bramatherium*, having not yet had the opportunity of examining the skull from Perim Island which is preserved in the Museum of the Royal College of Surgeons.

[2] Geol. Mag. vol. viii. 1871, pls. xii. & xiii.—The original memoir on *Sivatherium* is by Falconer and Cautley: "*Sivatherium giganteum*, a new fossil ruminant genus, from the valley of Murkunda, in the Sewalik branch of the Subhimalayan Mountains," Asiatic Researches, vol. xix. 1836, p. 1.

[3] R. Lydekker, *l. c.* vol. ii. pp. 118–142.

[4] L. Rütimeyer, 'Beiträge zu einer natürlichen Geschichte der Hirsche,' i. pp. 79–84.

frontalia. It is, however, a well-known fact that in the Giraffe the parietals participate also in the conformation of the horns. In the skull of a very young Giraffe, such as that which is to be seen in the remarkably instructive exhibition in the Hall of the British Museum, it is evident that the pair of horns are not formed alone by the bony processes which are situated partly on the frontals and to a large extent on the adjacent parietal region, but that those bones themselves are thrust up, the parietals still more than the frontals. It is not possible to demonstrate with certainty the coronal suture in the cast of the *Hydaspitherium* skull[1]. But its comparison with a young Giraffe, and with the so-called skull of *Helladotherium* from the Siwaliks, which is placed by Rütimeyer himself amongst the Giraffidæ[2], is strongly suggestive that in all three the parietal region has about the same extension and continues in the same direction as the frontal region. The horns of *Hydaspitherium*, in my opinion, thus occupy the same position as in the Giraffe—that is to say, on the parietal as well as on the frontal bones, only extending much more forwards than in the living genus.

In spite of the enormous elevation of the bones which form the brain-case, this last in *Hydaspitherium* is not much shorter than in the hornless skull of the Siwaliks.

Similarly I am inclined to believe that in *Sivatherium* the parietals also take part in the horizontal covering of the skull, so that the analogy with the Gnu and the Bovines, advocated by Rütimeyer[3], is not justified. The posterior antler-like pair of horns, according to my view, evidently arises from the parietals. The anterior pair occupies the same position as the horns of *Samotherium*, the homology with which is completed by the important fact that we can trace a suture between the anterior processes of *Sivatherium* and their supporting frontals.

The supposition as to the extension of the parietalia in *Sivatherium* and *Hydaspitherium* can be definitely proved only when we are able to trace the coronal suture; but even if Rütimeyer's improbable view as to the position of the parietalia were right, there would not be, for the reasons given, sufficient grounds for uniting these fossils with some of the Antelopes.

Be that as it may, the present exposition of facts corroborates Lydekker's view that *Sivatherium* and *Hydaspitherium* are nearly akin to the Giraffe[4].

[1] Lydekker was unable to trace the coronal suture in the original. He says in the description of the skull of *Hydaspitherium megacephalum* in question (Indian Tertiary and Post-Tertiary Vertebrata, vol. i. 1880, p. 163):—"Above the occipital crest the common base of the horn-cores rises almost vertically, somewhat after the manner of the intercoronal ridge of the oxen. It is impossible to say how much of this portion of the cranium is formed by the parietals and how much by the frontals, but I am inclined to think that in the middle line the parietals formed a very narrow strip as in the true oxen."

[2] *L. c.* pp. 74–78.

[3] L. Rütimeyer, 'Beiträge zu einer natürlichen Geschichte der Hirsche,' i. pp. 80–81.

[4] As to *Vishnutherium*, from the Siwaliks, described by Lydekker, I have no new observations of my own to offer, but I completely share Lydekker's views as

6. Helladotherium.

What I have to remark about the so-called *Helladotherium* supports the views above stated. As to the systematic position of *Helladotherium duvernoyi*, Gaud., from Pikermi [1], Rütimeyer agrees with Gaudry and Lydekker, that we have to do with a form related to the Giraffe [2].

With the *Helladotherium* of Pikermi Gaudry united a hornless skull from the Siwaliks, which had been originally considered by Falconer as a female *Sivatherium* [3]: Gaudry adds that Falconer himself inclines towards this opinion [4]. The French author confines himself to pointing out a few differences between the Pikermi and the Siwalik form which, in fact, as Lydekker remarks, would not be sufficient to justify a specific distinction of the two specimens. We have a nearly complete description of the Indian skull by Rütimeyer [5], not from the original, but from the drawing in the 'Fauna Antiqua Sivalensis.' Rütimeyer also unites the two specimens. The rather important differences between the two skulls he ascribes partly to the artist of the French plates, partly to the deformation of the Pikermi skull by crushing. I have been able to convince myself from an examination of the original Pikermi skull in Paris that the drawing is correct, and that the deformation is no more than Gaudry himself admitted ("un peu comprimé de haut en bas"); so that the remarkable elongation of the parietal region of the Pikermi skull, which presents difficulties to Rütimeyer, is perfectly natural. As may be seen from the accompanying sketches of the *Helladotherium* from Pikermi (fig. 3, p. 324) and the so-called *Helladotherium* from the Siwaliks (fig. 4 B, p. 325) the superior profile in the crania is remarkably different. The region above and behind the orbits is slightly hollowed in the Greek *Helladotherium*, whilst in the Siwalik skull a convexity is visible in the same position. As appears from the upper view of the Siwalik skull (fig. 4 A, p. 325), the highest point of the elevation in question would correspond to the hinder extremity of the nasals. Such being the case according to the drawing, the nasals would have extended backwards beyond the orbits, an arrangement unknown among Ruminants. A close examination of the original specimen shows, however, that this cannot be. As the cranial roof has been removed in this place, we see clearly that here are pneumatic

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expressed in the summary of the chapter devoted to this genus. "Whether these remains belong to one or to several species or genera, they unmistakably indicate a connecting link (or links) between the Sivathere and the Giraffe which so effectually bridges over the gap hitherto existing between these animals, as to do away with all family distinction between the two." (Indian Tertiary and Post-Tertiary Vertebrata, vol. ii. p. 116.)

[1] A. Gaudry, 'Animaux fossiles et Géologie de l'Attique,' pp. 252–264, pls. xli.–xliv.

[2] L. Rütimeyer, 'Beiträge zu einer natürl. Geschichte der Hirsche,' i. pp. 74–78.

[3] A description of the Plates in the 'Fauna Antiqua Sivalensis,' Supplementary Plate A. figs. 1–1 *c* (H. Falconer, Palæontological Memoirs and Notes, 1868, vol. i. p. 538).

[4] *L. c.* p. 260.

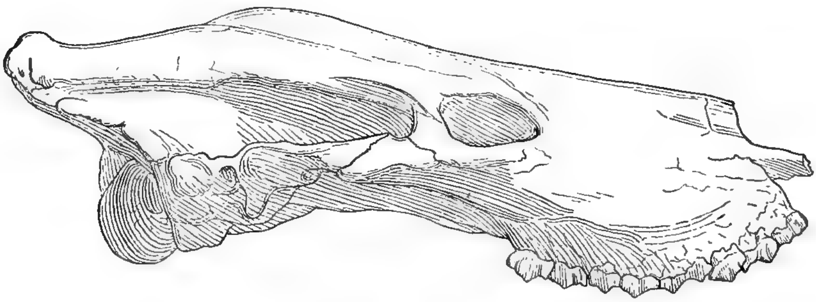
[5] *L. c.* pp. 75–78.

cavities filled with matrix exactly the same as those beneath the so-called unpaired horn of the Giraffe. So that what in the figure appears as the posterior half of the nasals is in reality situated in the frontal region behind the nasals. We have thus here the homologue of the median protuberance of the Giraffe.

The postorbital portion in the Siwalik hornless skull is a little more elongated than in *Sivatherium* and *Hydaspitherium*, and would have exactly the form of *Hydaspitherium* if the horns of this genus were removed; in the hornless skull the superior profile is nearly horizontal.

In the *Helladotherium* from Pikermi the parietal region is more elongated still, as has been already stated. Gaudry describes on its middle a feeble elevation of 2 cm. by 8 cm. in length, adding that it corresponds perhaps to a sort of horn or central pyramid. The examination of the original preserved in the Paris Museum showed me that we have in reality two crests, as is visible too in the side view, diverging a little forwards and circumscribing a sort of elevated plateau, which in front is about 1 decim. broad, at the back 75 millim.

Fig. 3.



Helladotherium duvernoyi.

Side view of skull, one-sixth nat. size (after Gaudry). Pikermi, Attica.

In front of these the profile runs nearly horizontal as in *Samotherium*, and very different from the proclivous direction in the Siwalik skull, which besides is much higher in this part.

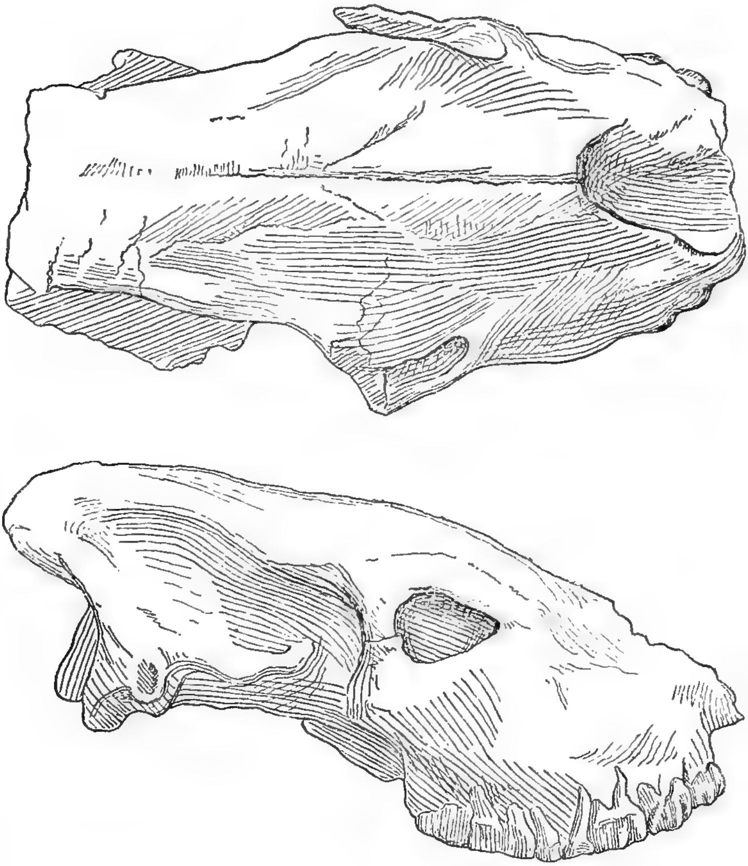
The orbits in both skulls are relatively small as in *Sivatherium* and *Hydaspitherium*; in the *Helladotherium* from Pikermi they are situated farther back.

There are several other differences between the two skulls which for the present purpose may be omitted. On the whole my conclusion is that, apart from a general likeness, they are so different from each other, that far from belonging to the same species they must even be ascribed to different genera. The Siwalik skull, except its being hornless, approaches so near to the horned forms of the Siwaliks just mentioned, but especially to *Hydaspitherium*, that I think the original view of Falconer, which later on was shared by Murie, is not so far from the truth as has been since supposed. Falconer considered it to be the female of *Sivatherium*, the only one of the three allied horned forms (*Sivatherium*, *Hydaspitherium*, *Bramatherium*) then known. The Sivatherium having somewhat different molars, whilst the teeth of *Hydaspitherium*, according to Lydekker, are not to be distinguished from those of the so-called *Helladotherium* from the Siwaliks, whilst, besides, the configuration of the skull approaches more to *Hydaspitherium*, I think that we have before us the female skull of a genus of which the male form cannot have differed much from the form presented by *Hydaspitherium megacephalum*, Lyd.

Fig. 4.

A

B



Sivatherium giganteum (female).

Upper view (A) and side view (B) of skull, one-sixth nat. size (after Falconer and Cautley). Siwalik Hills, India.

I wish to be far less positive as to the sex of the *Helladotherium* skull from Pikermi. Having before us in the Pikermi fossil a geologically older form, the development of horn-like appendages even in the male may not have advanced beyond the stage shown in the specimen figured by Gaudry.

At any rate we cannot be surprised at the general likeness of the two forms. The female skulls being more or less in all mammals, but especially in Ruminants, more *conservative* than the skulls of males, the resemblance of the Siwalik skull to a more generalized type, as represented by the *Helladotherium* skull of Pikermi, is not more than we might have anticipated.

June 2, 1891.

Prof. Flower, C.B., LL.D., F.R.S., President, in the Chair.

The Secretary read the following report on the additions to the Society's Menagerie during the month of May 1891:—

The registered additions to the Society's Menagerie during the month of May 1891 were 163 in number. Of these, 96 were acquired by presentation, 41 by purchase, 4 by exchange, 10 were born in the Gardens, and 12 were received on deposit. The total number of departures during the same period, by death and removals, was 89.

Amongst the former special attention may be called to the following:—

1. A female Water-buck Antelope (*Cobus ellipsiprymnus*) from British East Africa, presented by George L. Mackenzie, Esq., F.Z.S. This is a very acceptable arrival, as making a pair with the male of the same Antelope presented by Mr. Mackenzie in November last (see P. Z. S. 1890, p. 589).

2. Three Blanford's Rats (*Mus blanfordi*) from the Shevaroy Hills, Madras, presented by Mr. W. L. Sclater, F.Z.S., Deputy Superintendent of the Indian Museum, Calcutta. This species is new to the Collection.

Mr. Sclater made some remarks on animals which he had noticed during a recent visit to the Zoological Gardens of Paris, Ghent, Antwerp, Rotterdam, Amsterdam, and The Hague.

In the Jardin d'Acclimatation at Paris the colony of breeding Penguins, which Mr. Sclater had also inspected in the summer of 1890, was of special interest to the ornithologist. Twenty-two examples of the Black-footed Penguin (*Spheniscus demersus*) were kept in an open wire enclosure. Many of these had paired and nested in some wooden dog-kennels which had been placed in the enclosure. Last year five birds had been bred, and only one of these had been lost.

Of the three Sea-Lions living in the Jardin d'Acclimatation, one adult male appeared to be referable to *Otaria stelleri* and not to *O. gillespii*, the species usually brought from the Pacific coast of America, from which it seemed to be distinguishable externally by the sudden elevation of the front part of the cranium. But this determination would require confirmation after the death of the specimen.

A remarkable hybrid Pheasant in this Garden was said to have been produced by a male *Lophophorus impeyanus* and a female *Euplocamus albocristatus*.

The Menagerie in the Jardin des Plantes was fortunate in still having a male example of the Black African Rhinoceros (*Rhinoceros bicornis*), received about ten years ago.

From the Antwerp Gardens Mr. Sclater had succeeded in obtaining a few interesting birds for the Society's collection. Amongst these were two small Hornbills (*Toccus erythrorhynchus*) and two African Spoonbills (*Platalea alba*), the latter being new to the Society's series.

In the Zoological Gardens of Rotterdam two interesting Antelopes had lately been received from the Congo: these were a female of *Tragelaphus gratus* and a male *Cephalophus dorsalis*. The colony of wild Herons adjoining the large covered aviary in which the Night-Herons bred (see P. Z. S. 1889, p. 219) was still flourishing and consisted this year of twenty-eight pairs.

The Gardens of the Royal Zoological Society of Amsterdam (since the death of the late Mr. Westerman under the direction of Dr. C. Kerbert) had been next visited and many objects of interest had been noted. Amongst these were a pair of the Elk (*Alces machlis*), born in the Gardens on the 13th of June, 1890, a pair of the Bantang Ox of the Sunda Island (*Bos banteng*), and a female example of the Sassabey Antelope (*Damalis lunata*). The herd of the graceful Antelope (*Tragelaphus gratus*) (see above p. 213) now consisted of a male, two females, and two young ones lately born.

In the small Zoological Garden at the Hague, Mr. Sclater had noticed an example of a beautiful species of Ground-Pigeon, *Phlegœnas tristigmata*, (see Ibis, 1865, pl. ix.), of Celebes, which he had never seen before alive.

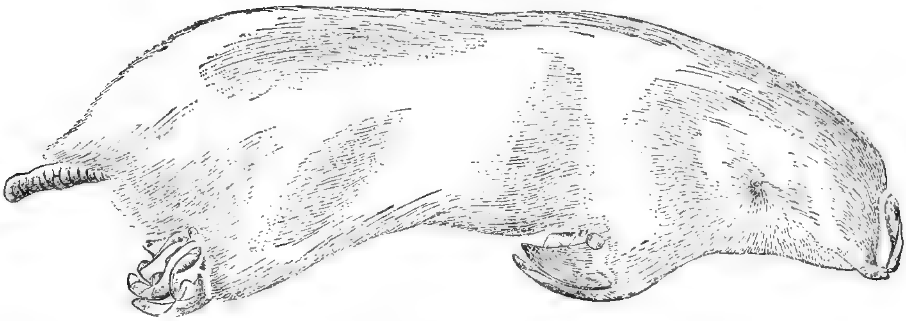
A drawing, sent to England by Professor E. C. Stirling of the University of Adelaide, M.D. and a Corresponding Member of the Society, was exhibited. This, being the first received in Europe, represented the remarkable Australian mammal which that gentleman had now called *Notoryctes typhlops*, having described it without a name in 'Nature' (vol. xxxviii. p. 588) of the 18th of October, 1888, in the following terms:—

"The total length is 13 cm., inclusive of the tail, which is 2 cm. long. The head, relatively shorter than in *Chrysochloris*, has a rounded muzzle, the dorsal surface of which is covered by a horny shield. Nostrils transversely slit-like. No eyes visible, the skin passing uninterruptedly over the ocular region; but on reflecting the skin on one side of the face a small circular pigment-spot is visible in the position of the eye. No apparent bony orbit. Tongue fleshy, broad at the base, and tapering to a blunt point. No external ears, but the ear-openings distinct, 1 mm. wide, and covered over with fur.

"The fore limbs are short, resembling somewhat those of a Mole; but the manus is folded, so that the large nails of the fourth and fifth digits only are visible in the natural position of the limbs. Of these nails the fourth is 15 mm. long and of a uniform width of

4 mm., ending very bluntly; the fifth is very slightly shorter than the fourth, broad at the base (8 mm.), tapering rapidly to a blunt point, the two together forming an outline rather like that of a goose-mussel (*Lepas*). The nails of the third, second, and first digits, very much smaller, form a series gradually diminishing in size in the order named, and constitute a second row on the inside of the fourth and fifth, by which, as stated, they are completely concealed from view. What corresponds to the palm is the cleft between the two rows of digits.

"The hind limbs are also short, with the soles turned outwards.



Outline of *Notoryctes typhlops.*

What appears to be the fifth (anterior) digit is very short, with a short, broad, and strong nail; the fourth is armed with a long (7 mm.), narrow, curved, and sharp claw; while the claws of the third, second, and first are broad, flat, rounded at their points, and joined together by a membrane which extends nearly to their points. On the sole there is a hard, elongated, horny tubercle crossing it transversely.

"The tail 2 cm. long, and 5 mm. wide at the insertion, tapers to 3 mm. and terminates in a knob-like tip.

"About 15 mm. in front of the vent (?cloaca) there is a pouch in the integument about 4 mm. wide, with the opening directed backwards and having a depth in a forward direction of from 4–5 mm. The surface of this pouch is devoid of hair, but the bare area is surrounded by thick fawn-coloured fur, with a slightly reddish tint; it is possible, however, that this reddish tint is due wholly or in part to some ferruginous-looking sand which is much mixed up with the fur. The body generally, with the exception of the lower two-thirds of the tail, which is bare, is covered with fur of a rather lighter tint.

"With regard to the internal parts, it is unfortunate that the specimen came to us completely eviscerated and in a bad state of preservation generally; but in a small part of the lower bowel which was left, remains of ants were found. The bowel terminates at a wide vent (?cloaca), and I can find no trace of a separate genital aperture, nor of such openings into the supposed cloaca. I have not yet had time to examine with minuteness the skeleton, which unfortunately is also considerably damaged, especially about the occipital region; but from a cursory examination of the recently skinned body, I can note the following points with, I believe, accuracy:—

"Cranium relatively large, no bony orbits; zygomatic arches present; well-developed shoulder-girdles with slender clavicles, pectoral muscles large; pelvis large and strong, with a rather wide symphysis pubis, but no epipubic bones, either actual or rudimentary; ribs 14; angle of lower jaw markedly inflected.

"The teeth are peculiar, and require a more extended description than I can give at present, but the formula appears to be:—

$$\text{i. } \tfrac{3}{3}, \text{ c. } \tfrac{1}{1}, \text{ m. } \tfrac{6}{5} \left(? \tfrac{\text{p. 2, m. 4}}{\text{p. 1, m. 4}}\right).$$

"This, however, may require some modification, as just posterior and external to the premolar (or first molar) of the right ramus of the mandible there is a small rudimentary conical tooth, which is not to be found on the opposite side, nor at corresponding positions in the maxilla."

Portions of a letter since addressed by Professor Stirling, on 29th of October, 1890, to Professor Newton were also read as follows:—

". . . . As to the new beast. . . . I am very sorry that various causes . . . . have prevented my working it out . . . . It turns out not to be a Monotreme, but a Marsupial, with Mole-like configuration. The marsupial bones are exceedingly small nodules and escaped my notice at first. Four or five of the cervical vertebræ are fused, and there is a keeled sternum, an enormously thick and short first rib, which serves the purpose of buttressing the sternum in lieu of coracoids; a bird-like pelvis, with the ischia abutting on the spinal column; penis in the urogenital canal, and testes external in front of the penis; eyes mere pigment-spots underneath the skin and *temporalis* muscle. Altogether it is a curious beast . . . . the Mole-type of Marsupials. It has a remarkable habit of burrowing for long distances in the sand, and with great rapidity . . . . I have four specimens, but only one in good preservation, which is not to be wondered at when I say that they came 1500 miles wrapped up in a kerosined rag, and I have not been able to get any more . . . . This is the whole story and I regret the delay . . . . While I am working it out I should like to keep all the specimens I have, as, with one exception, they are not good alike in the soft parts, and I shall want them to supplement each other."

In a later letter from Prof. Stirling, dated 29th March, 1891, he informed the same correspondent that he was then about to cross the Australian continent from Port Darwin to Adelaide, where he expected to arrive about the present time, hoping to travel through the portion of the country inhabited by *Notoryctes*, and to obtain from the natives some more specimens, though he was careful to say that "they are not common" there. The full description of this form had, it was understood, already appeared in the 'Transactions of the Royal Society of South Australia,' though no copy of it had yet reached England.

The Secretary exhibited on behalf of Mr. F. E. Blaauw, C.M.Z.S., specimens of some Long-tailed Tits shot by him last year in Holland and belonging to the museum of the Royal Zoological Society "Natura Artis Magistra." They had been sent to this country for the purpose of ascertaining whether they belonged to the British form *Acredula rosea* or the white-headed Continental form *A. caudata* (see Dresser's 'Birds of Europe,' vol. iii. pp. 63–67). There could be no doubt that these birds belonged rather to the British form with striped head; but Mr. Blaauw stated that the white-headed form was also met with in Holland, and that he had occasionally observed examples of the two forms paired together.

Mr. Frank Finn, B.A., exhibited a male hybrid between the Chilian Pintail (*Dafila spinicauda*) ♂ and Summer Duck (*Æx sponsa*) ♀, bred in the Gardens, and pointed out that it differed from both parents, though it was to a certain extent intermediate.

The following papers were read:—

1. On the Land and Freshwater Shells of Perak. By O. F. von Moellendorff, Ph.D.

[Received April 15, 1891.]

(Plate XXX.)

Since the publication of my paper on the Land-Shells of Perak (Journ. As. Soc. Beng. lv. pt. ii. no. 4, 1886), Dr. R. Hungerford has been kind enough to supply me with some more materials from that hitherto very imperfectly known region. Mr. J. de Morgan, who collected in Perak in 1884, published descriptions of some new species in 'Le Naturaliste' (vii. 1885, no. 9, pp. 68–70), and gave a more extensive memoir on the conchological fauna of the Malacca peninsula in the Bulletin Soc. Zool. de France (x., 1885), with figures of his novelties. This latter work I did not know of when I wrote the above-mentioned paper, and the study of it now enables me to rectify some of my former classifications, and at the same time to correct a number of errors contained in de Morgan's work. I think it therefore advisable to give now a revised catalogue of all the Land and Freshwater Shells at present known from Perak, with descriptions of some further new species.

Fam. Streptaxidæ.

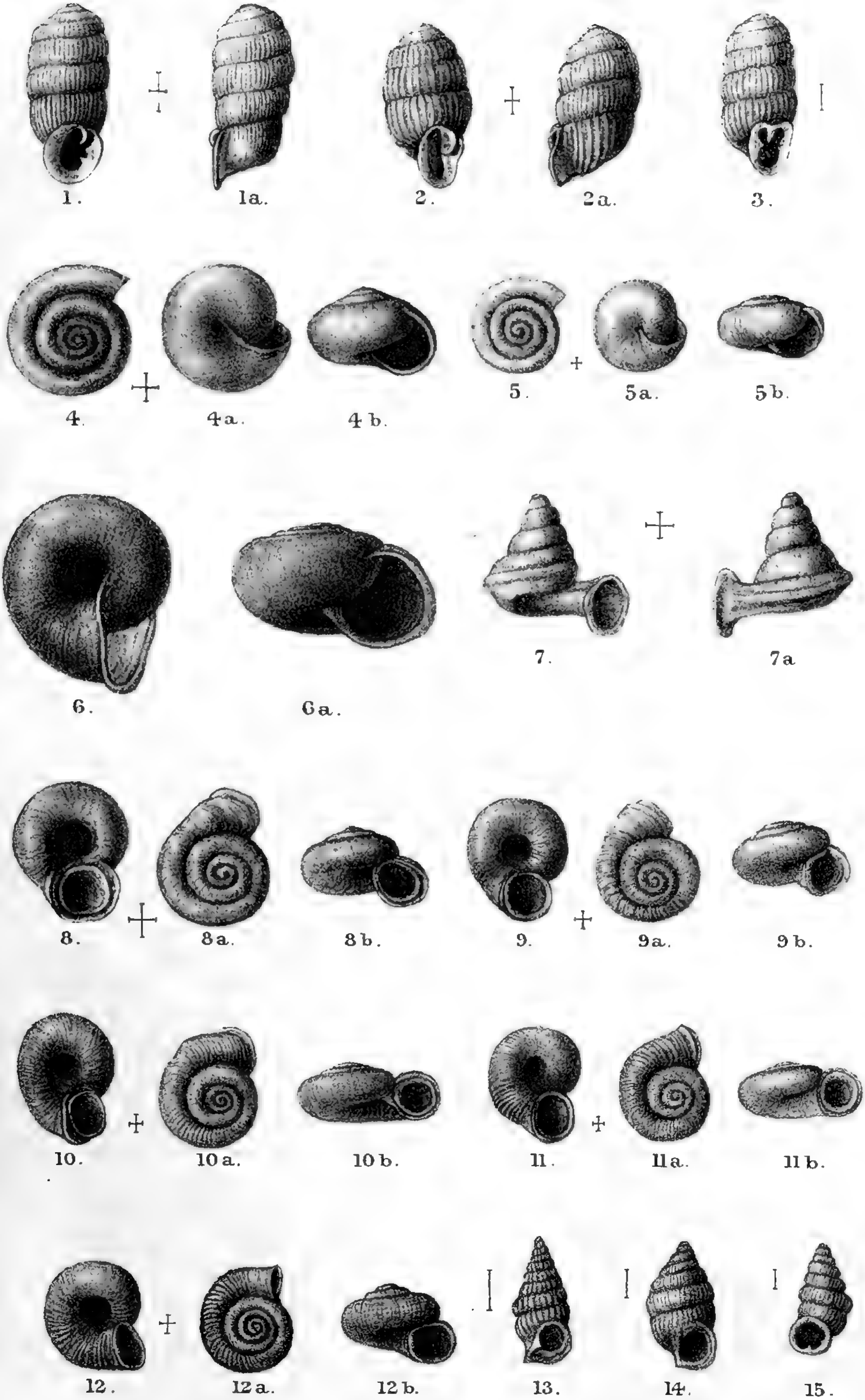
1. Streptaxis plussensis, de Morgan.

Streptaxis plussensis, de Morgan, Le Nat. 1885, p. 68; Bull. Soc. Zool. Fr. x. 1885, p. 23, t. i. fig. 1.

Mt. Tchehel, Pluss valley (*de Morgan*).

A good new species, somewhat related to *S. lemyrei*, Morel., from Cambodia.

Dr. Hungerford obtained at Bukit Pondong a few specimens o



R. Mintern del. et lith. Mintern Bros. imp.

LAND SHELLS OF PERAK.

a small white *Patula*-like shell, which from its fine and regular striation, the silky aspect, and the inner varices must be an immature *Streptaxis*, but not identical with the above species. It has a diameter of only 3 mm. and shows already $5\frac{1}{2}$ whorls.

2. Ennea (Microstrophia) perakensis, Godw.-Aust. & G. Nev. (Plate XXX. figs. 1, 1 *a*.)

Ennea perakensis, Godw.-Aust. & G. Nevill, P. Z. S. 1879, p. 735, t. lix. fig. 2 (juv.); v. Mölldff. J. As. Soc. Beng. lv. 1886, p. 300; Ancey, Bull. Soc. Mal. Fr. v. 1888, p. 341.

Bukit Pondong (*Hungerford*).

In the remarks on the name of the subgenus to which this species belongs, I have committed the error of writing *Martensia*, Nevill, instead of *Nevillia*, Martens. The latter name has been given by Prof. von Martens to a group of Mascarene Enneas (Beitr. Faun. Maur. 1880), but it was preoccupied by H. Adams (P. Z. S. 1868, p. 289) for a genus of the Rissoidæ. The group, which comprises a number of Indian, Chinese, and Mascarene species, I have renamed *Microstrophia* (Jahrb. deutsch. malakoz. Ges. xiv. 1887, p. 22). The Perak species is closely allied to *E. stenopylis*, Bens.

3. Ennea (Microstrophia) hungerfordiana, v. Mölldff. (Plate XXX. figs. 2, 2 *a*.)

Ennea hungerfordiana, v. Mölldff. l. c. p. 301.

Bukit Pondong (*Hungerford*).

4. Ennea (Microstrophia) subcylindrica, v. Mölldff. (Plate XXX. fig. 3.)

T. anguste perforata, fere cylindracea, albido-hyalina; spira superne conoideo-convexa, apice obtuso, tum cylindracea. Anfr. 7, convexiusculi, costulis verticalibus subdistantibus—36 *in anfractu penultimo—regulariter sculpti, ultimus angustior, basi subcompressus, paullum ascendens. Apertura verticalis, rotundato-tetragona; peristoma latiuscule expansum, albo-callosum, superne continuum, subsolutum, sinuatum, margo dexter ad insertionem subito attenuatus. Lamella parietalis valida, longe intrans.*

Alt. 2·75, *diam.* 1 *mm.*

Hab. ad Bukit Pondong leg. cl. R. Hungerford.

Fam. Vitrinidæ.

5. Vitrina nucleata, Stol.

Vitrina nucleata, Stol. J. As. Soc. Beng. xlii. 1873, p. 23, t. i. fig. 12, t. ii. figs. 4–6.

Helicarion nucleatus, Tryon, Man. Pulm. i. p. 177, t. 41. figs. 49–51.

Bukit Pondong (*Hungerford*); Penang (*Stoliczka*).

Tryon places this species in *Helicarion*, whilst Stoliczka distinctly states it to be a *Vitrina*.

6. ? Vitrinopsis douvillei, de Morg.

Gaeotis douvillei, de Morgan, Bull. p. 40, t. iv. fig. 9.

Mt. Tchabang (*de Morgan*).

The figure of the animal shows no trace of a mucous pore, so that the species cannot be a *Parmarion* or *Girasia*. In *Gaeotis* (=*Peltella*) the mantle covers the shell entirely; besides, the occurrence of a West-Indian and South-American genus on the Malay Peninsula would be inconsistent with all our experience of the distribution of land-shells. I believe that this interesting discovery of de Morgan will prove to be a *Vitrinopsis*, hitherto not found outside the Philippine Islands. The shell agrees perfectly with the Philippine species, and the figure of the animal, at least, does not oppose this classification.

Fam. Naninidæ.

7. Helicarion lowi, de Morgan.

Helicarion lowi, de Morg. Bull. p. 25, t. 1. fig. 3.

Mt. Kerbou, 2200 metres altitude (*de Morgan*).

A fine large species, of 32 mm. diameter.

8. Macrochlamys stephoides, Stol.

Helix (*Macrochlamys*) *stephoides*, Stol. J. As. Soc. Beng. xlii. 1873, p. 17, t. i. fig. 9, t. ii. figs. 19, 20.

Macrochlamys stephoides, de Morgan, Bull. p. 27.

Kinta valley (*de Morgan*); Penang (*Stoliczka*).

9. Macrochlamys hatchongi, de Morgan.

Macrochlamys hatchongi, de Morg. Bull. p. 28, t. i. fig. 6.

Between Lahat and Ipoh, Kinta valley (*de Morgan*).

10. Macrochlamys jousoufi, de Morgan.

Macrochlamys jousoufi, de Morg. l. c. p. 29, t. i. fig. 7.

Ipoh, Kinta valley (*de Morgan*).

This and the preceding *Macrochlamys* seem to be varieties of one and the same species, closely allied to *M. kumahensis*, Theob. & Stol., from Aracan.

11. Macrochlamys bartoni, de Morgan.

Macrochlamys bartoni, de Morg. l. c. p. 30, t. 1. fig. 8.

Mt. Tchöra, Kinta valley (*de Morgan*).

Somewhat like *M. consepta*, Bens., in outline, but very much smaller and less striated.

12. Euplecta bijuga, Stol.

Rotula bijuga, Stol. J. As. Soc. Beng. xlii. 1873, p. 14, t. i. figs. 4–7, t. v. figs. 16–18; Tryon, Man. Pulm. ii. p. 22, t. iv. figs. 56–59.

Rotularia bijuga, de Morgan, Bull. p. 30.

Euplecta bijuga, v. Mölldff. l. c. p. 302.

Bukit Pondong (*Townsend, Hungerford*); Penang (*Stoliczka*).

13. Euplecta pataniensis, de Morgan.

Macrochlamys pataniensis, de Morgan, Bull. p. 28, t. i. fig. 5.

Rhaman, Patani (*de Morgan*).

Certainly of the same group as the last species, and, so far as can be judged from the figure, not very different from *E. anceps*, Gld., Tenasserim.

14. Sitala carinifera, Stoliczka.

Sitala carinifera, Stoliczka, J. As. Soc. Beng. xlii. 1873, p. 16, t. i. fig. 8; Godw.-Aust. Land & Freshw. Moll. Ind. ii. 1882, p. 35; v. Mölldff. l. c. p. 302; Tryon, Man. Pulm. ii. p. 54, t. xxv. fig. 16.

Bukit Pondong (*Hungerford*); Penang (*Stoliczka*).

15. Kaliella perakensis (G. Nevill).

Kaliella perakensis, Godwin-Austen, l. c. i. 1882, p. 8, t. ii. fig. 7; Tryon, Man. Pulm. ii. p. 61, t. xxvi. fig. 59.

Perak (*Townsend*); Bukit Pondong (*Hungerford*).

16. Microcystina townsendiana, G. Nev. & Godw.-Aust.

Microcystina townsendiana, G. Nevill & Godw.-Aust. P. Z. S. 1879, p. 736, t. lix. fig. 1; v. Mölldff. l. c. p. 302.

Nanina (Microcystis) townsendiana, Tryon, Man. Pulm. ii. p. 120, t. 40. figs. 49–51.

Bukit Pondong (*Townsend, Hungerford*).

17. Lamprocystis malayana, v. Mölldff. (Plate XXX. figs. 4–4 *b*.)

T. semiobtecte perforata, depressa, tenuis, subpellucida, corneo-lutescens, nitens; spira humilis, depresse conica, apice obtuso. Anfr. 5, *levissime convexiusculi, sutura appressa submarginata disjuncti, lente accrescentes, tenuissime striatuli, ultimus basi convexus. Apertura parum obliqua, rotundato-elliptica valde excisa; peristoma simplex, acutum, margine columellari superne breviter reflexo, subcalloso.*

Diam. max. 3·66, *alt.* 2 *mm.*

Hab. ad Bukit Pondong leg. cl. R. Hungerford.

Allied to *L. molecula*, Bens., from Burmah, but smaller and much flatter.

18. Lamprocystis conulina, v. Mölldff. (Plate XXX. figs. 5–5 *b*.)

T. anguste perforata, depresse globoso-conica, tenuis, pellucida, nitens, corneo-flavescens; spira conoidea, lateribus subconvexis. Anfr. $4\frac{1}{2}$, *sat convexi, sutura impressa discreti, microscopice striatuli, ultimus basi inflatus. Apertura sat obliqua, exciso-subcircularis; peristoma simplex, acutum, margine columellari brevissime reflexo.*

Diam. max. 1·66, *alt.* 1·25 *mm.*

Hab. ad Bukit Pondong leg. cl. R. Hungerford.

19. Hemiplecta striata, Gray, var. leechi, de Morg.

Hemiplecta leechi, de Morgan, Bull. p. 31, t. i. fig. 9.

Abundant all over Perak (*de Morgan*).

The author compares his form with *H. crossei* and *H. weinkauffiana*; I think, however, that it will prove to be a variety of the common species of Singapore and the Straits generally, *Nanina striata*, Gray, or *Helix naninoides*, Benson.

20. Hemiplecta sakaya, de Morg.

Oxytes sakaya, de Morg. Bull. p. 32, t. ii. fig. 1.

Mt. Kerbou, 1200 metres altitude.

Allied to *H. cymatium*, Bens., of which it is perhaps a variety. The specimen collected by Dr. Hungerford and mentioned by me (*l. c.* p. 302) as *H. cymatium*, probably belongs to this form.

21. Rhysota sp. aff. *pluto*, Pfr.

Cf. v. Mölldff. l. c. p. 302.

Perak (*Hungerford*).

22. Ariophanta kintana, de Morgan.

Ariophanta kintana, de Morg. Bull. p. 33, t. ii. fig. 2.

Kinta district (*de Morgan*).

This was probably mentioned by Nevill (Handl. Moll. Ind. Mus. 1878, p. 20) as *Ariophanta*, n. sp. (prox. *A. interruptæ*), from Qualla Kangsa, Perak.

Ariophanta lahatensis, de Morgan, Bull. p. 34, t. ii. fig. 4, between Lahat and Ipoh, Kinta valley, seems to be based on an immature specimen, which might very well be the young of the present species.

Fam. Trochomorphidæ.

23. Trochomorpha timorensis, v. Mart.

Trochomorpha timorensis, de Morgan, Bull. p. 35.

Mt. Tchöra, Kinta valley (*de Morgan*); Penang (*Stoliczka*).

Helix swettenhami, de Morgan, Le Naturaliste, 1885, p. 68, and *H. thieroti*, de Morgan, *ibid.* p. 68, both belonging to either *Trochomorpha* or else *Plectotropis*, do not appear in his second memoir. The latter species probably is the one now mentioned as *T. timorensis*.

Fam. Helicidæ.

24. Satsuma perakensis, Crosse.

Geotrochus perakensis, Crosse, J. de Conch. xxvii. 1879, p. 199, t. viii. fig. 4; de Morgan, Bull. p. 38.

Helix perakensis, v. Mölldff. l. c. p. 303.

Perak (*Townsend*); Kinta valley (*de Morgan*).

Most decidedly not a *Geotrochus*, but one of the conical *Fruticicola*-like shells, for which Adams created the subgenus *Satsuma* (=*Fruticotrochus*, Kob.). This group is widely spread over Eastern Asia, from Japan, China, the Malay Peninsula, to the Philippine Islands and the Malay Archipelago.

25. ? HELIX BOURYI, de Morgan.

Helix bouryi, de Morg. Bull. p. 35, t. ii. fig. 3 (*Petasia*).

Mt. Tchöra, Kinta valley.

The author classes this small snail, 3 mm. in diameter and height, as a *Petasia*. I should have thought it to be a form of *Naninidæ*, if the peristome were not described as slightly reflexed. It will prove to be a *Satsuma*.

26. CHLORITIS PENANGENSIS, Stol.

Trachia penangensis, Stoliczka, J. As. Soc Beng. xlii. 1873, t. iii. figs. 1, 18–20.

Fruticicola penangensis, de Morgan, Bull. p. 36.

Bukit Pondong (*Hungerford*); all over Perak (*de Morgan*); Penang (*Stoliczka*).

27. CHLORITIS MALAYANA, v. Mölldff. (Plate XXX. figs. 6, 6 *a*.)

Helix (*Trachia*) *malayana*, v. Mölldff. l. c. p. 303,—an =*Planispira breviseta*, Crosse, J. de Conch. xix. 1876, p. 336 (nec Pfr.)?

Perak (*Hungerford*).

28. CHLORITIS WRAYI, de Morgan.

Philidora wrayi, de Morgan, Bull. p. 36, t. ii. fig. 5.

Lahat, Ipoh, Kinta valley (*de Morgan*).

29. CHLORITIS HARDOUINI, de Morgan.

Helix hardouini, de Morgan, Le Naturaliste, 1885, p. 68.

Philidora hardouini, de Morgan, Bull. p. 37, t. i. fig. 10.

Between Lahat and Ipoh, Kinta valley (*de Morgan*).

Both Stoliczka and de Morgan have placed true species of *Chloritis* into different genera. The former accepted *Trachia* as a separate genus, and classed *H. penangensis, procumbens*, Gld., *delibrata*, Bens., and *gabata*, Gld., with it; but whilst he was quite right in establishing a genus for these species, the name *Trachia* should not have been applied to it. The type of *Trachia* is *H. asperella*, Pfr., and the group should be restricted to those Indian species with almost circular apertures and very approximate margins of the peristome, as *H. asperella, fallaciosa*, Fér., *ruginosa*, Fér., and others. The chief characteristic of *Chloritis* is the sculpture, which consists of impressed points, placed in *quite regular quincunx*, bearing short hairs or setæ, always present in young specimens, often also in the adults. Besides this typical sculpture, there is always a keel or angle round the umbilicus which disappears at the basal margin of the peristome, effecting at that place a slight production of the lip. The general form of the shell is variable, most species showing very narrow whorls. Taken in this sense, the genus *Chloritis* includes to my knowledge the following species:—

Solomon Islands: *C. hombronis*, Pfr., *erinaceus*, Pfr., *gaimardi*, Desh.

Torres Strait: *C. buxtoni*, Braz., *brevipila*, Pfr.

Philippine Islands: *C. sanziana*, Hombr. & Jacq., *spinosissima*, Semp., *quieta*, Reeve, *leytensis*, v. Möllldff., *brevidens*, Pfr., *caliginosa*, Ad. & Rve., *malbatensis*, Hid.

Malay Archipelago: *C. tomentosa*, Pfr., *crassula*, Phil., *gruneri*, Pfr.

Malay Peninsula: *C. deliciosa*, Pfr., *breviseta*, Pfr., *malayana*, v. Möllldff., *penangensis*, Stol., *delibrata*, Bens., *gabata*, Gld., *procumbens*, Gld., *hardouini*, de Morg., *wrayi*, de Morg., *samuiana*, v. Möllldff.

China: *C. herziana*, v. Möllldff., *hungerfordiana*, Nev., *franciscanorum*, Gredl., ? *submissa*, Desh.

Fossil: *C. lepidotricha*, Alph. Br.

I have no doubt that there are many more species to be placed in this interesting genus, but I have purposely only mentioned those examined by myself.

The name *Philidora*, de Morgan, is to be entirely rejected, although Prof. von Martens has rendered it the unmerited honour of adopting it for *H. gabata* (J. Linn. Soc., Zool. xxi. 1887, p. 162). As the author says himself (*l. c.* p. 36, note), the name is meant to replace *Philina*, Albers, the latter being preoccupied by *Philina*, Ascanius (1772). Now *Philina*, Albers (Hel. 1st ed. 1850, p. 119) contains mostly species of *Obba*, a few *Planispiræ*, and only one *Chloritis* (*brevidens*, Pfr.), and was already in the second edition referred to the synonymy of *Obba*. There was therefore not the slightest reason to revive and to rename it. To create a new group for the species in question was also unnecessary, as they without any doubt belong to *Chloritis*. Only if it was thought advisable to make a special subgroup or section of all carinated forms of *Chloritis*, the name might be retained; but as we have species of *Chloritis* with rounded, subangulate, angulate, and keeled periphery, such subdivision would be artificial and unscientific.

Fam. Bulimidæ.

30. Amphidromus perversus, Linn.

Perak (*Townsend*); all over Perak and Patani (*de Morgan*).

31. Amphidromus melanomma, Pfr.

Mt. Tchöra, Mt. Tchehel (*de Morgan*). Otherwise known from Singapore, Penang, Borneo.

32. ? Amphidromus chloris, Reeve.

Larut plain and Kinta valley (*de Morgan*).

Described from the Philippine Islands, so that its occurrence in Perak is somewhat surprising. I cannot but doubt the correctness of the identification.

Fam. STENOGYRIDÆ.

33. HAPALUS JOUSSEAUMI, de Morgan, Bull. p. 24, t. i. fig. 2.

Ipoh, Kinta valley (*de Morgan*).

34. PROSOPEAS TCHEHELENSE, de Morgan.

Stenogyra tchehelensis, de Morgan, Le Natural. 1885, p. 69; Bull. p. 40, t. ii. fig. 7.

Stenogyra (*Subulina*) *tchehelensis,* v. Mölldff. l. c. p. 304.

Stenogyra (*Opeas*) ? *terebralis,* Theob. (? n. sp.), G. Nevill, Handl. Moll. Ind. Mus. 1878, p. 166.

Bukit Pondong (*Townsend, Hungerford*); Mt. Tchehel, Pluss valley (*de Morgan*).

The Perak species does not, as I have stated formerly, belong to *Subulina,* the columella only being slightly twisted, not truncated, but to the genus or subgenus *Prosopeas,* constituted by Moerch for *S. haughtoni* and *S. roepstorfi* of the Andamans.

Stenogyra swettenhami, de Morgan, Bull. p. 41, t. ii. fig. 6, seems to me only a slight variation of *T. tchehelense.*

35. OPEAS GRACILE, Hutt.

Bukit Pondong (*Hungerford*).

36. RHODINA PERAKENSIS, de Morgan.

Rhodina perakensis, de Morgan, Le Nat. 1885, p. 68; Bull. p. 42, t. ii. fig. 9; v. Mölldff. l. c. p. 305.

Mt. Tchöra, Kinta valley (*de Morgan*).

I must confess that even the more complete description and the figure given by the author in his second memoir has not enabled me to form a decided opinion on this alleged new genus. De Morgan calls the "columellar lip" spiral, reflex, and very prominent; the figure shows a sort of spiral lamella obliquely running from the columella into the aperture, a formation which indeed resembles somewhat the columellar lamella of *Rhodea.* This is, however, the only resemblance to the American genus which this curious shell presents.

Fam. PUPIDÆ.

37. PUPA (BOYSIDIA) PALMIRA, Stol.

Pupa (*Scopelophila*) *palmira,* Stoliczka, J. As. Soc. Beng. xlii. 1873, p. 32, t. ii. fig. 3.

Pupa palmira, Pfr. Mon. Hel. viii. p. 409.

Scopelophila palmira, de Morgan, Bull. p. 43.

Penang and Province of Wellesley (*Stoliczka*).

38. HYPSELOSTOMA HUNGERFORDIANUM, v. Mölldff. (Plate XXX. figs. 7, 7 *a.*)

T. sat aperte umbilicata, turbinata, tenuis, corneo-brunnea, opaca. Anfr. $4\frac{1}{2}$, *angulato-convexi, sutura valde impressa disjuncti,* *parum striatuli, supremi spiram concave turrito-conicam, apice mammillari subexcentrico, efficientes, ultimus carina exserta rotundata ad peripheriam, altera ad umbilicum obtusiore, supra et infra carinam periphericam sulco spirali leviter impresso cinctus, a quarta parte solutus, porrectus, leviter ascendens, in parte soluta fere tetragonus, basi spiraliter lineolatus. Apertura fere verticalis, aliquantulum sursum spectans, rotundato-quadrangularis, intus dentibus 7 lamelliformibus coarctata, quorum 4 majores, ad modum crucis oppositi, parietalis validus longe intrans, bipartitus, inter illum et columellarem 3 minoribus interpositis. Peristoma liberum, simplex, tenue, sat late expansum, inter binas lamellas profundiuscule sinuatum.*

Diam. max. 3, *alt.* 2½, *apert. diam. cum perist.* 1 *mm.*

Hypselostoma bensonianum, v. Mölldff. l. c. p. 306 (*nec* Blanf.).

Hab. ad Bukit Pondong leg. cl. R. Hungerford.

Although I have not yet been able to compare authentic specimens of *H. bensonianum*, Blfd., from Ava, I am convinced that the Perak form cannot be combined with it, and that it constitutes a good new species. It is somewhat more conical and comparatively higher than the Ava form, the upper whorls are more convex, not "planulati" as Blanford has it, the last whorl is more detached and stretches to the right; facing the shell the whole aperture is visible in *H. bensonianum*, only part of it in *H. hungerfordianum*. There are seven instead of four teeth. I suppose that the additional fifth tooth mentioned by Blanford means that the parietal tooth or lamella is divided as in the Perak species, but the latter possesses three more between the parietal and columellar lamellæ.

The following species of *Hypselostoma* are now known:—

1. *H. tubiferum*, Bens.—Ava.
2. *H. bensonianum*, Blfd.—Ava.
3. *H. dayanum*, Stol.—Moulmein.
4. *H. hungerfordianum*, v. Mölldff.—Perak.
5. *H. transitans*, v. Mölldff.—Samui Island, Gulf of Siam.
6. *H. crossei*, Morl.—Tonking.
7. *H. luzonicum*, v. Mölldff.—Luzon. } Philippine Islands.
   ——, var. *imbricata*, v. Mölldff.—Cebu. } Philippine Islands.

The genus is connected by *H. transitans* with *Boysidia*, Ancey, a subgenus of *Pupa* created for *P. hunanensis*, Gredl., *P. strophostoma*, v. Mölldff., and others from China, to which I believe some Indian species, as *P. palmira*, Stol., *plicidens*, Bens., *salwiniana*, Theob., likewise belong. *Hypselostoma* is an extreme development of the *Boysidia* type.

Fam. CLAUSILIIDÆ.

39. CLAUSILIA (PSEUDONENIA) FILICOSTATA, Stol., var. TENUICOSTA, G. Nevill.

Clausilia (*Pseudonenia*) *filicostata*, var. *tenuicostata*, G. Nevill, Handl. Moll. Ind. Mus. 1878, p. 183; H. Crosse, J. de Conch. xxvii. 1879, p. 337; v. Mölldff. l. c. p. 306.

Phaedusa filicostata, de Morgan, Bull. p. 43.

Bukit Pondong (*Townsend, Hungerford*).

The type was described from Penang.

40. Clausilia (Pseudonenia) kapayanensis, de Morgan.

Pseudonenia kapayanensis, de Morgan, Bull. p. 43, t. ii. fig. 8.

Gounang Lano (*de Morgan*).

De Morgan cites two "genera" of Clausiliidæ, *Phaedusa* and *Pseudonenia*. To begin with, we have not sufficient reasons as yet to consider *Phaedusa* to be a separate genus, but even if such were the case, *Pseudonenia* would anyhow be only a section of *Phaedusa*, not another genus. The worst of it is that *C. filicostata* and *penangensis*, which de Morgan quotes as *Phaedusa*, belong certainly to *Pseudonenia* as well as his new species. The latter is, in fact, very closely allied to *C. filicostata*, especially to its Perak variety; and I would not hesitate to identify it with the latter, if the author did not speak of a third "tooth" on the columellar margin, meaning an emerged columellar lamella, which is not visible in *C. filicostata*.

Fam. Auriculidæ.

41. Cassidula mustelina, Desh.

Prov. of Wellesley (*de Morgan*).

42. Cassidula auris-felis, Brug.

Bukit Tambun, mouth of Perak river (*de Morgan*).

43. Auricula auris-judæ, Linn.

Bukit Tambun, Prov. of Wellesley (*de Morgan*).

44. Auricula auris-midæ, Linn.

Estuary of Krian river (*de Morgan*).

45. Pythia borneensis, Ad.

Telok-Anson, Bukit Tambun (*de Morgan*).

Fam. Limnæidæ.

46. Planorbis exustus, Desh.

Wellesley (*de Morgan*).

Fam. Cyclophoridæ.

47. Cyclotus (Platyrhaphe) hungerfordianus, v. Mölldff.

Cyclotus hungerfordianus, v. Mölldff. l. c. p. 306.

Cyclotus, n. sp., G. Nevill, Handl. 1878, p. 256.

? *Aulopoma lowi*, de Morgan, Le Nat. 1885, p. 69; Bull. p. 59,
VII t. ~~iii~~. fig. 6.

The comparison of de Morgan's figure makes it all but certain that his "*Aulopoma*" *lowi* is the same as my *Cyclotus hungerfordianus*. It is decidedly a *Cyclotus* and belongs to my group *Platyrhaphe* (Jahresb. Senckenb. 1890, p. 267=*Cycloti suturales*, v. Mart.); how it could have been mistaken for an *Aulopoma* is hardly to be comprehended. I still think that the publication of a *Cyclotus* as an *Aulopoma* does not entitle the name to priority, besides the description is not sufficiently detailed and lucid.

48. Opisthoporus solutus, Stol.

Opisthoporus solutus, Stoliczka, J. As. Soc. Beng. xli. 1872, p. 266, t. x. figs. 8–10; Crosse, J. de Conch. xxvii. 1879, p. 337; v. Möllduff. l. c. p. 307; de Morgan, Bull. p. 51.

Bukit Pondong (*Townsend, Hungerford*); Mt. Tchöra and Lano, Kinta valley (*de Morgan*).

Cyclotus dautzenbergi, de Morgan, l. c. p. 50, t. iv. fig. 1, from Mt. Tchöra near Ipoh, is, according to the figure given, undoubtedly an *Opisthoporus*, and most probably identical with *O. solutus*, Stol., which de Morgan quotes from the same locality.

49. Opisthoporus penangensis, Stol.

Opisthoporus penangensis, Stoliczka, l. c. p. 265, t. x. fig. 7; H. Crosse, l. c. p. 338; de Morgan, Bull. p. 51; v. Mölldff. l. c. p. 307.

Bukit Pondong (*Townsend, Hungerford*); Perak generally (*de Morgan*).

Cyclophorus lahatensis, de Morgan, Bull. p. 61, t. iv. fig. 7, from the Kinta valley, is apparently a young shell, of 11 millim. diameter. The author compares it to "*Cyclophorus*" *penangensis*, Stol., meaning probably *Opisthoporus penangensis*, which species he had mentioned 10 pages before.

50. Rhiostoma jousseaumi, de Morgan.

Rhiostoma jousseaumi, de Morgan, Bull. p. 52, t. iv. fig. 2.

Kinta valley.

According to the description and the very meagre figure, the classification of this species as a *Rhiostoma* is not quite beyond doubt. The detached last whorl and the tube connecting it with the penultimate whorl render it rather probable, but the description of the operculum does not mention the curious cup-shaped formation characteristic of *Rhiostoma*.

51. Pterocyclus regelspergeri, de Morgan.

Cyclophorus regelspergeri, de Morgan, Le Naturaliste, 1885, p. 69.
Pterocyclus regelspergeri, de Morgan, Bull. p. 52, t. iv. fig. 3.
? *Spiraculum regelspergeri*, v. Mölldff. l. c. p 308.

Upper Kinta valley (*de Morgan*); Larut (*coll. Ind. Mus.*).

De Morgan's mention of a tube behind the aperture is misleading and made me suppose that the species belonged to *Spiraculum*. It is not a proper tube, but only an enlarged "wing" typical of *Pterocyclus*. The species is very much like *P. albersi*, Pet.

52. Cyclophorus borneensis, Metc.

Cyclophorus borneensis, de Morgan, Bull. p. 60.

Kinta valley (*de Morgan*).

As this Bornean form has been found also in Sumatra, by Prof. von Martens, at Bukit Tima, Singapore, and by Stoliczka in Penang, it may very well range into Perak. Still, a revision of de Morgan's identification would be desirable in this very difficult group.

53. Cyclophorus semisulcatus, Sow.

Bukit Pondong (*Townsend*); Perak generally (*de Morgan*).

54. Cyclophorus aurantiacus, Schumacher.

Cyclophorus aurantiacus, E. von Martens, Shells of Mergui, Journ. Linn. Soc., Zool. xxi. 1887, p. 157, t. xiv.

Cyclophorus lowi, de Morgan, Le Nat. 1885, p. 69.

Cyclophorus malayanus, de Morgan, Bull. p. 62; v. Mölldff. l. c. p. 309.

Larut (*coll. Ind. Mus.*); Perak generally (*de Morgan*).

From the able paper of Prof. von Martens I have convinced myself that the large Perak *Cyclophorus* does not belong to *C. malayanus*, but to *C. aurantiacus*, Schum. *C. lowi* of de Morgan's first paper is not mentioned in the second; he seems to have entirely ignored his former publication in the latter.

Whether *C. malayanus*, mentioned by G. Nevill, Handl. 1878, p. 267, as brought from Bukit Pondong by Dr. Townsend, is the true species of Benson or likewise a form of *C. aurantiacus*, I am unable to say.

55. Cyclophorus expansus, Pfr.

Cyclophorus expansus ? var., G. Nevill, Handl. 1878, p. 269. ("Appears to be new; it is near *C. cybeus*.")

Bukit Pondong (*Townsend*).

56. Lagochilus townsendi, Crosse.

Lagochilus townsendi, Crosse, J. de Conch. xxvii. 1879, p. 208, t. viii. fig. 3; de Morgan, Bull. p. 63; v. Mölldff. l. c. p. 309.

Bukit Pondong (*Townsend, Hungerford*); Perak generally (*de Morgan*).

57. Lagochilus swettenhami, de Morgan.

Lagochilus swettenhami, de Morgan, Bull. p. 64, t. iv. fig. 8.

Kinta and Pluss valleys (*de Morgan*).

It does not appear whether "*Cyclophorus baylei*," de Morgan, Le Nat. 1885, p. 69, is identical with the first or the second of these species.

58. Leptopoma aspirans, Bens., Ann. Mag. N. H. 2nd ser. xvii. 1856, p. 229.

Bukit Pondong (*Townsend, Hungerford*).

Fam. ALYCÆIDÆ.

59. ALYCÆUS (ORTHALYCÆUS) GIBBOSULUS, Stol.

Alycæus (*Orthalycæus*) *gibbosulus*, Stoliczka, J. As. Soc. Beng. xli. 1872, p. 268, t. x. fig. 14; Crosse, J. de Conch. xxvii. 1879, p. 339, t. xii. fig. 8; de Morgan, Bull. p. 54; v. Mölldff. l. c. p. 310; =*A. chaperi*, de Morgan, Le Nat. 1885, p. 70 (olim).

Bukit Pondong (*Townsend, Hungerford*); Mt. Tchöra, Kinta valley (*de Morgan*). Penang (*Stoliczka*).

60. ALYCÆUS (ORTHALYCÆUS) PERAKENSIS, Crosse.

Alycæus (*Orthalycæus*) *perakensis*, Crosse, J. de Conch. xxvii. 1879, p. 206, t. xii. fig. 7; de Morgan, Bull. p. 54; v. Mölldff. l. c. p. 310.

Bukit Pondong (*Townsend, Hungerford*).

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61. ALYCÆUS (ORTHALYCÆUS) KAPA~~Y~~ENSIS, de Morgan.

Alycæus (*Orthalycæus*) *kapayensis*, de Morgan, Bull. p. 55, t. iv. fig. 5.

Mt. Lano, Kinta valley.

A small species, $4\frac{1}{2}$ millim. in height.

62. ALYCÆUS (ORTHALYCÆUS) THIEROTI, de Morgan.

Alycæus (*Orthalycæus*) *thieroti*, de Morgan, Bull. p. 55, t. iv. fig. 6.

Mt. Lano (*de Morgan*); Bukit Pondong (*Hungerford*).

Another small species, with which I identify an *Alycæus* collected by Hungerford at Bukit Pondong.

As the description of the author is rather incomplete and somewhat vague, I give a new diagnosis from my specimens obtained at Bukit Pondong.

T. peranguste perforata, globoso-conica, ? luteo-brunnea; spira regulariter conica, apice acuto. Anfr. $4\frac{1}{2}$–*5, convexi, regulariter et confertim costulato-striati, ultimus inflatus, gibber, circiter* $2\frac{1}{2}$ *millim. ab apertura constrictus, tum ad aperturam glabratus, tubulus suturalis brevis. Apertura sat obliqua, subcircularis; peristoma duplex, externum late expansum, companulatum, interruptum, internum continuum, expansiusculum, superne appressum.*

Diam. max. $4\frac{3}{4}$–5, *alt.* $4\frac{3}{4}$–5 *mm.*

63. ALYCÆUS DIPLOCHILUS, v. Mölldff. (Plate XXX. figs. 8–8 *b*.)

Alycæus diplochilus, v. Mölldff. l. c. p. 310.

Bukit Pondong (*Hungerford*).

64. ALYCÆUS OLIGOPLEURIS, v. Mölldff. (Plate XXX. figs. 9–9 *b*.)

Alycæus oligopleuris, v. Mölldff. l. c. p. 310.

Bukit Pondong (*Hungerford*).

65. Alycæus microdiscus, v. Mölldff. (Plate XXX. figs. 10–10 *b*).

Alycæus microdiscus, v. Mölldff. l. c. p. 311.

Bukit Pondong (*Hungerford*).

66. Alycæus parvulus, v. Mölldff. (Plate XXX. figs. 11–11 *b*.)

Alycæus parvulus, v. Mölldff. l. c. p. 311.

Bukit Pondong (*Hungerford*).

67. Alycæus microconus, v. Mölldff. (Plate XXX. figs. 12–12 *b*.)

Alycæus microconus, v. Mölldff. l. c. p. 311.

Bukit Pondong (*Hungerford*).

68. Alycæus jousseaumi, de Morgan.

Alycæus jousseaumi, de Morgan, Le Nat. 1885, p. 70; Bull. p. 54, t. iv. fig. 4; v. Mölldff. l. c. p. 312.

Mt. Lano, Kinta valley (*de Morgan*).

This fine species, the largest *Alycæus* known to me, is allied to *A. umbonalis*, Bens., and *A. physis*, Bens., but at once to be distinguished by the formation of two peristomes rather distant from each other, somewhat in the manner of *Cyclophorus foliaceus*, Chemn.

Fam. Diplommatinidæ.

69. Opisthostoma paulucciæ, Crosse & Nevill.

Opisthostoma paulucciæ, Crosse & Nevill, J. de Conch. xxvii. 1879, pp. 197, 205, 339, t. viii. fig. 1; Godw.-Aust. & G. Nev. P. Z. S. 1879, p. 738, t. lx. figs. 2, 2 *a*, 2 *b*; v. Mölldff. l. c. p. 313.

Bukit Pondong (*Townsend*).

70. Opisthostoma perakense, Godw.-Aust. & G. Nev.

Opisthostoma perakense, Godw.-Aust. & G. Nev. P. Z. S. 1879, p. 738, t. lx. figs. 1, 1 *a*, 1 *b*; v. Mölldff. l. c. p. 313.

Bukit Pondong (*Townsend, Hungerford*).

71. Diplommatina (Sinica) canaliculata, v. Mölldff. (Plate XXX. fig. 13.)

Diplommatina (*Sinica*) *canaliculata*, v. Mölldff. l. c. p. 312.

Bukit Pondong (*Hungerford*).

72. Diplommatina (Sinica) nevilli, Crosse.

Palaina nevilli, Crosse, J. de Conch. xxvii. 1879, pp. 203, 339, t. viii. fig. 2.

Diplommatina nevilli, v. Mölldff. l. c. p. 313.

Bukit Pondong (*Townsend, Hungerford*).

73. Diplommatina (Sinica) ventriculus, v. Mölldff. (Plate XXX. fig. 14.)

T. dextrorsa, vix rimata, ventricoso-conica, lutescens. Anfr. $7\frac{1}{2}$, *convexi, striati, supremi spiram regulariter conicam efficientes, penultimus magnus, ultimus angustior, sat distortus, initio constrictus, tum inflatulus, ad aperturam paullum ascendens, basi subcristatus. Apertura fere verticalis, angulato-subcircularis; peristoma subduplex, sat expansum, incrassatum, albolabiatum, superne appressum, margine basali cum columellari angulum fere rectum calcaris instar prominentem formante. Lamella columellaris fere immersa, oblique intuenti conspicua, spiraliter recedens, palatalis interna, modica, crassiuscula, supra columellam conspicua.*

Longit. 3, *diam. max.* 1·75 *mm.*

Hab. ad Bukit Pondong leg. cl. R. Hungerford.

74. Diplommatina (Sinica) diminuta, v. Mölldff. (Plate XXX. fig. 15.)

T. sinistrorsa, vix rimata, gracilis, turrita, corneo-flavescens: spira turrito-conica, apice obtusiusculo brunnescente. Anfr. $7\frac{1}{2}$, *perconvexi, medio subangulati, oblique costulato-striati,* 2 *ultimi paullum distorti, ultimus penultimo angustior, initio constrictus, tum inflatulus, antice ascendens. Apertura parum obliqua, angulato-subcircularis; peristoma duplex, externum campanulatum, expansum, internum sat porrectum, expansiusculum, margine columellari cum basali angulum subacutum formante. Lamella columellaris modica, obliqua, palatalis longiuscula, supra rimam tranlucens.*

Longit. 2, *diam. max.* 0·9 *mm.*

Hab. ad Bukit Pondong leg. cl. R. Hungerford.

The four preceding species have, besides a very strongly developed columellar lamella, which is produced into the interior up to the constriction at the beginning of the last whorl, an inner parietal and palatal plait; the latter is shining through just above the mouth. Breaking up the shell just before the constriction, we see the three plaits like teeth placed in a triangle; they serve as a kind of rails for the operculum, which rests behind them on the constricted part of the whorl when the animal is retired. This development of the closing apparatus is typical for my section *Sinica* (Jahrb. deutsch. malak. Ges. xii. 1885, p. 369); as secondary character may be considered the angle formed by the columella with the basal margin of the peristome often ending in a spur-like projection. "*Sinica*" is rather a misnomer, as species of this group have since been found on the Philippine Islands and the Malay Peninsula; some Indian species, e. g. *D. gracilis*, Bedd., likewise belonging to it.

75. Diplommatina (Sinica) superba, Godw.-Aust. & G. Nev.

Palaina superba, Godw.-Aust. & G. Nev. l. c. p. 732, t. lx. figs. 5, 5*a*.

Diplommatina superba, v. Mölldff. l. c. p. 313.

Bukit Pondong (*Townsend, Hungerford.*).

As I have pointed out, the similarity of this pretty little shell to some species of *Palaina* consists chiefly in the sculpture, on which, however, generic or subgeneric distinctions should not be based. *Palaina* is to be restricted to those species which have a constriction at the beginning or within the first third of the last whorl, but no plaits or lamellæ. *D. superba* having a strongly developed columellar plait, cannot therefore be classed as a *Palaina*, but is a true *Diplommatina*, and by its short palatal plait visible above the aperture belongs to the same section as the four preceding species.

76. Diplommatina mirabilis, Godw.-Aust. & G. Nev.

Diplommatina mirabilis, Godw.-Aust. & G. Nev. P. Z. S. 1879, p. 739, t. lx. figs. 4, 4*a*, 4*b*.

Bukit Pondong (*Townsend*).

Fam. Pupinidæ.

77. Pupina aureola, Stol.

Pupina aureola, Stoliczka, J. As. Soc. Beng. xli. 1872, p. 267, t. x. figs. 11, 12; de Morgan, Bull. p. 66.

Mt. Tchöra, Kinta valley (*de Morgan*).

I received from the late Mr. R. Damon some specimens of a Perak *Pupina* under the name of *P. lahatensis*, de Morgan, apparently collected by that gentleman. The name was probably abandoned by the author, as it does not appear in his paper. One of these examples corresponds exactly with the figure of *P. aureola*, Stol., the others with *P. lowi*, de Morgan.

78. Pupina lowi, de Morgan.

Pupina lowi, de Morgan, Bull. p. 66, t. iii. fig. 3.

Lahat, Kinta valley (*de Morgan*).

79. Pupina arula, Bens.

Pupina arula, Benson, Ann. Mag. N. H. 2nd ser. xvii. p. 230; Pfr. Mon. Pneum. Suppl. i. p. 95; Novitat. Conch. ii. p. 141, t. xxxvii. fig. 7–9; Crosse, J. de Conch. xxvii. 1879, p. 340; v. Mölldff. l. c. p. 314.

Bukit Pondong (*Townsend, Hungerford*).

The Perak form is smaller, 8 instead of 9 millim. in length, comparatively more slender, showing a diameter of 4 millim. instead of 5, or a proportion of axis to diameter of 2 : 1 instead of 9 : 5; the apex is more pointed. It should therefore be separated as a variety:

Var. perakensis, v. Mölldff.: *testa minore, graciliore, apice acutiore; alt.* 8, *diam.* 4 *mm.*

80. Pupina artata, Bens.

Bukit Pondong (*Dr. Townsend* fide *Crosse*); Kinta valley (*de Morgan*).

The small *Pupina* collected by Hungerford at Bukit Pondong, which I took for *P. artata*, Bens., following Crosse, is certainly different from Benson's species. It is smaller, the apex more pointed, almost mucronate, the mouth much more protracted to the right, the upper parietal lamella much smaller and not, as in *P. artata*, covering the upper canal; the outer margin of the peristome is more receding above, forming a decided, almost tooth-like angle before it recedes. All these differences are quite constant in the dozen of examples which I have examined and entitle the form to specific distinction. Judging from de Morgan's figure, they belong to the following species.

81. Pupina tchehelensis, de Morgan.

Pupina tchehelensis, de Morgan, Bull. p. 66, t. iii. fig. 4.

Pupina artata, v. Mölldff. l. c. p. 314 (*non* Benson).

Mt. Tchenel (*de Morgan*); Bukit Pondong (*Hungerford*).

82. Coptochilus sectilabrum, Gould.

Perak (*Townsend*); Larut (*coll. Ind. Mus.*). Known from Penang, Tenasserim.

83. Hybocystis elephas, de Morgan.

Hybocystis elephas, de Morgan, Le Nat. 1885, p. 70; Bull. p. 56, t. iii. fig. 1; Fischer, J. de Conch. 1885, p. 174, t. x. (anat.); Crosse, ibid. p. 183, t. xi.; v. Mölldff. l. c. p. 314.

Valley of Perak river (*de Morgan*); Larut (*coll. Ind. Mus.*).

Hybocystis jousseaumi, de Morgan (Le Nat. 1885, p. 70; Bull. p. 57, t. iii. fig. 2), from the same locality, appears to be based on smaller and dead specimens and is to be suppressed (*cf.* v. Mölldff. l. c. p. 315; Crosse, J. de Conch. 1887, p. 275).

Fam. Hydrocenidæ.

84. Georissa monterosatiana, Godw.-Aust. & G. Nev.

Georissa monterosatiana, Godw.-Aust. & G. Nev. P. Z. S. 1879, p. 738, t. lix. fig. 6; v. Mölldff. l. c. p. 316.

Bukit Pondong (*Townsend, Hungerford*).

85. Georissa semisculpta, Godw.-Aust. & G. Nev.

Georissa semisculpta, Godw.-Aust. & G. Nev. P. Z. S. 1879, p. 740, t. lix. figs. 3, 3*a*.

Bukit Pondong (*Townsend*).

Fam. Ampullariidæ.

86. Ampullaria turbinis, Lea, var. subampullacea, G. Nev.

Ampullaria turbinis, var. *subampullacea*, G. Nev. Handl. Moll. Ind. Mus. ii. 1884, p. 6.

Ampullaria sumatrensis, de Morgan, Bull. p. 70.

Perak (*Townsend*). Malay Peninsula generally (*de Morgan*).

Ampullaria perakensis, de Morgan (l. c. p. 70, t. iv. fig. 12), and *A. wellesleyensis*, de Morgan (l. c. p. 71, t. iv. fig. 13), are probably young shells.

Fam. Viviparidæ.

87. Viviparus sumatrensis, Dunker.

Paludina bengalensis, subsp. *polygramma*, G. Nevill, Handl. Moll. Ind. Mus. ii. 1884, p. 22.
Paludina sumatrensis, de Morgan, Bull. p. 67.
Qualla Kangsa (*Townsend*) ; Perak generally (*de Morgan*).

88. Bythinia kintana, de Morgan.

Bythinia kintana, de Morgan, Bull. p. 68, t. iii. fig. 7.
Kinta valley (*de Morgan*).

Fam. Assimineidæ.

89. Assiminea carinata, Lea.

Omphalotropis carinata, de Morgan, Bull. p. 69.
Assiminea carinata, Boettger, Jahrb. d. mal. Ges. xiv. 1887, p. 166.
Kinta valley (*de Morgan*).

Dr. Boettger, in his important monograph of *Assiminea*, considers this species to be a true *Assiminea*. De Morgan's note on its habitat does not contradict this classification ; according to him it lives in marshy parts of the forest near brooks as well as in vegetable mould.

Fam. Melaniidæ.

90. Melania (Striatella) tuberculata, Müll.

Melanoides tuberculata, de Morgan, Bull. p. 73.
Prov. Wellesley (*de Morgan*).

91. Melania (Striatella) malayana, Iss.

Melania tuberculata, var. *malayana*, Issel, Moll. Born. p. 100.
Melania malayana, Brot, Mart. Chemn. Mel. p. 253, t. 26. figs. 5, 5 *a*.
Melania tuberculata, subsp. *malayana*, G. Nevill, Handl. ii. p. 247.
Melanoides malayanus, de Morgan, Bull. p. 74.
Sarawak (*Issel*). Abundant in all the brooks of the Malay Peninsula (*de Morgan*).

92. Melania (Striatella) truncatula, Lam.

Melanoides truncatulus, de Morgan, Bull. p. 73.
Prov. Wellesley (*de Morgan*).

93. Melania (Melanoides) episcopalis, Lea.

Melania variabilis, Bens., subsp. *episcopalis*, G. Nevill, Handl. ii. p. 256.
Sermyla episcopalis, de Morgan, Bull. p. 72.
Qualla Kangsa (*Townsend* fide *Nevill*). Abundant in Perak generally (*de Morgan*).

Var. PERAKENSIS, de Morgan.

Sermyla perakensis, de Morgan, Bull. p. 73, t. iv. fig. 14 = *Melania infracostata*, Reeve, Conch. Ic. fig. 14 (*non* Mouss.), *teste* de Morgan.

Kinta valley (*de Morgan*).

"*Sermyla*" *chaperi*, de Morgan, l. c. p. 72 (unfigured), is hardly more than a slight variation of *M. episcopalis*. The brown bands occur also in the type, and the second series of nodules in several varieties, *e. g.* var. *menkeana*, Lea, to which de Morgan's alleged new species belongs.

Fam. UNIONIDÆ.

94. ANODONTA CUMINGII, Lea.

Kinta valley (*de Morgan*). Malacca, Java, Borneo, Siam, Cambodia.

95. ANODONTA CHAPERI, de Morgan.

Anodonta chaperi, de Morgan, Bull. p. 75, t. v. figs. 1, 2.

Kinta valley (*de Morgan*).

96. UNIO PERAKENSIS, de Morgan.

Unio perakensis, de Morgan, Bull. p. 76, t. v. figs. 3, 4.

Kinta valley (*de Morgan*).

Fam. CYRENIDÆ.

97. CORBICULA MALACCENSIS, Desh.

Kinta valley (*de Morgan*). Malacca (*Deshayes*).

EXPLANATION OF PLATE XXX.

Figs. 1, 1 *a*. *Ennea* (*Microstrophia*) *perakensis*, p. 331.
2, 2 *a*. —— (——) *hungerfordiana*, p. 331.
3. —— (——) *subcylindrica*, p. 331.
4–4 *b*. *Lamprocystis malayana*, p. 333.
5–5 *b*. —— *conulina*, p. 333.
6, 6 *a*. *Chloritis malayana*, p. 335.
7, 7 *a*. *Hypselostoma hungerfordianum*, p. 337.
8–8 *b*. *Alycæus diplochilus*, p. 342.
9 9 *b*. —— *oligopleuris*, p. 342.
10–10 *b*. —— *microdiscus*, p. 343.
11–11 *b*. —— *parvulus*, p. 343.
12–12 *b*. —— *microconus*, p. 343.
13. *Diplommatina* (*Sinica*) *canaliculata*, p. 343.
14. —— (——) *ventriculus*, p. 343.
15. —— (——) *diminuta*, p. 344.

2. Note on the Derivation and Distribution of the Insectivora of the New World. By G. E. Dobson, M.A., F.R.S.

[Received April 24, 1891.]

Of the ten Families into which the Insectivora are divisible, two only[1], and these very closely allied, namely *Soricidæ* and *Talpidæ*, are represented in the New World, and of the first-named family, composed of eleven genera, three genera only—*Sorex*, *Blarina*, and *Notiosorex* (with a single species)—have representatives in that continent, where all are restricted to the Nearctic Region. On the other hand, the closely connected Palæarctic Region includes representatives of no less than eight genera, nearly four-fifths of the whole. All the species of the two genera inhabiting the American continent belong to the Red-toothed Shrews, and are, in fact, modified forms of either *Sorex* or of *Soriculus*, the former common to both the Palæarctic and Nearctic Regions, the latter found only in a limited portion of the north-eastern parts of the Eastern Hemisphere, but represented in the Nearctic Region by the species of *Blarina*.

While the species of *Blarina* are characteristic of the Nearctic Region, those of *Sorex* are, with few exceptions, closely related one to another, so much so as to be, in my opinion, Nearctic local races only of two well-known Palæarctic species, namely *S. vulgaris* and *S. minutus* (= *S. pygmæus*), of which the former extends to North America, and the latter is represented there by its but slightly modified descendant *S. personatus* (= *S. cooperi*) and its varieties.

The Nearctic Shrews were therefore evidently derived from the Palæarctic Region, having migrated from thence probably at a comparatively recent period, if we may judge from the fact that the Water-Shrews of the New World are still referable to the genus *Sorex*, the changes in their bodily structure due to their altered mode of life not having yet advanced nearly so far as we find in the much more highly specialized Water-Shrews (*Crossopus*) of the Old World.

Assuming then, as I believe we are entitled to from a consideration of the above-mentioned facts, that the American Shrews were derived from the Palæarctic Region, it is only reasonable to suppose that the immigration took place by the shortest route, namely, from west to east. The total absence of the White-toothed Shrews from the Nearctic Region goes far to prove that the place of entrance of the ancestors of the American Shrews from the Asiatic continent must have occurred at some position north of N. lat. 50°, for one species at least of the genus *Crocidura* extends as far north as the region of the Ussuri river[2]. However, there is no difficulty in supposing that the entrance took place in the latitude of Behring's

[1] Not taking into account the *Solenodontidæ*, the species of which are limited to the islands Cuba and Hayti.

[2] A tributary of the Amur River, in E. Manchuria.

Strait at a time when the continents were united at that point, for I have examined specimens of *Sorex vulgaris* and of *S. minutus* from higher latitudes, namely, from the banks of the Khatanga and of the Olenek rivers within the Arctic Circle.

The Red-toothed Shrews are, in fact, pre-eminently boreal in their distribution, braving the most rigorous climates of the northern parts of both hemispheres, and thinning out quickly, to finally disappear altogether as we advance south. Their limit appears to be a climatic rather than a territorial one: thus their southern extent in the Palæarctic Region may be very correctly stated to be bounded by the isothermal of 60° Fahr.; the few exceptions noticeable, such as the presence of species of *Soriculus* south of this line on the southern slopes of the Himalayas, being easily accounted for by the fact that these animals are rarely found there at a lower elevation than 6000 feet, where they enjoy a really temperate climate. This explains how it happens that Shrews are wholly absent from South America. Two species only are found in Central America, where they extend as far south as Costa Rica, being, like the species of *Soriculus* [1], stragglers from the north along the high mountains and elevated table-lands, and therefore enjoying, like them, a comparatively temperate climate, their further advance southward being evidently prevented by the long depression which separates the mountains and elevated plateau of Costa Rica from the Andes, and not by the competition of other animals in the Neotropical Region, as writers on geographical distribution would have us believe. The high temperature of the Isthmus of Panama has, in fact, proved as effectual a barrier to these inhabitants of a boreal zone as the low temperature of the ancient northern isthmus between Asia and America was of old to the sun-loving White-toothed Shrews. There cannot be the least doubt that had a sufficient number of individuals of any of the species of White-toothed Shrews effected an entrance into North America, they would speedily have found their way into the southern part of that continent and thence into South America, and have continued to exist and multiply there.

Similar remarks apply to the *Talpidæ*, the species of which are, like those of the Red-toothed Shrews, restricted to the temperate and sub-boreal zones of the Northern Hemisphere, the instances in which there appears to be an exception to this rule, as in the case of two species which are found on the southern slopes and spurs of the Himalayas, being accounted for by the high elevation of the districts which they inhabit. Of the seventeen known species, four only are found in the New World, and these have much the same distribution as the Red-toothed *Soricidæ*, the chief difference noticeable being that none have been found as yet north of the southern parts of the shores of Hudson's Bay nor to the south of Mexico, the high tem-

[1] These have hitherto been supposed to be limited to the southern slopes of the Himalayas; but I have recently discovered, in the collection of the Paris Museum, a specimen of *Soriculus caudatus* from the mountains of Western Fo-Kien, China, so that it is probable that this genus has really its head-quarters in countries to the north and north-east of the Himalayas.

perature of Central America proving, in their case, even a more effectual barrier to their progress southward than with the Red-toothed *Soricidæ*, examples of which, as we have seen, extend as far as Costa Rica. Looking at the small number of American species, and taking into consideration the fact that, while it is possible to imagine the highly differentiated New-World Moles as capable of being derived by modification from a common progenitor resembling those of the genus *Talpa*, the reverse being unimaginable, it follows that they, like the species of *Soricidæ*, were also most probably derived from the Palæarctic Region, whence their ancestor or ancestors found their way into North America by the same route as the Red-toothed Shrews. The close relationship existing between *Urotrichus* (*Neürotrichus*) *gibbsi*, from the Pacific slopes of the Rocky Mountains, and *Urotrichus talpoides* of Japan, points indubitably to a common ancestor for these species at least, and their limitation to the opposite shores of the same ocean to the route by which the parent form entered the New World.

3. On Reptiles, Batrachians, and Fishes from the Lesser West Indies. By G. A. Boulenger.

[Received May 15, 1891.]

A first report on the Reptiles and Batrachians collected for the West Indies Exploration Committee was published in 1888 [1] by Dr. Günther, dealing with collections made by Mr. Ramage in the Island of Dominica. A list of the Reptiles of Barbados was published by Col. Feilden in 1889 [2]. The present contribution deals with further collections received from Dominica (collectors Mr. G. A. Ramage and Dr. H. A. A. Nicholls, C.M.Z.S.), St. Lucia (Ramage), and St. Vincent, Becquia and Moustiques (collected by Mr. H. H. Smith and presented to the British Museum by Mr. F. D. Godman).

I. Dominica.

The following species are additions to Dr. Günther's list.

1. Hemidactylus mabouia, Mor.

2. Sphærodactylus microlepis, R. & L.

Snout pointed, as long as the distance between the eye and the ear-opening, once and a half the diameter of the orbit; ear-opening small, oval, vertical. Rostral moderately large, with longitudinal cleft above; nostril pierced between the rostral, the first labial, and three scales; three upper labials; four lower labials, the first longer than the three others together; mental large, its posterior border truncate and in contact with two scales. A small spine-like scale on the upper eyelid, above the middle of the eye. All the scales on

[1] Ann. & Mag. N. H. (6) ii. pp. 362–366.
[2] Zoologist, (3) xiii. pp. 295–298, 352 & 353.

the head, body, limbs, and tail very strongly keeled; scales on the snout larger than those on the back of the head; scales on the back and sides rhomboidal, not imbricate, small on the middle of the back, increasing in size towards the sides, where they are only a little smaller than the ventrals; the latter scales hexagonal and imbricate; 62 scales round the middle of the body. Tail cylindrical, tapering; upper caudal scales pointed and raised, giving the organ a roughish appearance; lower caudal scales larger, rhomboidal, imbricate; no subcaudal enlarged shields. Dark brown above, with some lighter dots; pale brown beneath.

	millim.
Total length	77
Head	10
Width of head	6
Body	27
Fore limb	11
Hind limb	14
Tail	40

This Gecko differs from *S. copii*, Stdr., of which male and female specimens were obtained by Mr. Ramage in Dominica, in the smaller dorsal scales, the strongly keeled ventrals, and the absence of subcaudal shields.

A single male specimen, collected by Dr. Nicholls.

3. TYPHLOPS PLATYCEPHALUS.

Typhlops platycephalus, Dum. & Bibr. vi. p. 293 (1844); Jan, Icon. Gén. Ophid. p. 18, livr. 3, pls. iv. & v. fig. 8 (1864).

Ophthalmidion fuscum, A. Dum. Cat. Méth. Rept. p. 203 (1851).

Typhlops fuscus, Jan, *op. cit.* p. 22, livr. 5, pls. v. & vi. fig. 4.

Snout rounded, rather depressed, strongly projecting; nostrils lateral. Rostral about one third the width of the head, extending to the level of the eyes; nostril between two nasals, the anterior of which is in contact with the first and second labials; præocular present, a little narrower than the nasal or the ocular, in contact with the third labial only; eyes distinct; upper head-scales not or scarcely enlarged; four upper labials. Diameter of body 40 to 50 times in the total length; tail as long as broad or a little longer than broad, ending in a spine. 24 scales round the body. Blackish brown above and below, uniform or with a few of the scales of the middle ventral row white; lower surface of snout and anal region usually white.

Of this little known *Typhlops*, originally described from Martinique, numerous specimens were obtained by Mr. Ramage and Dr. Nicholls. The largest measures 360 millim.

4. OXYRHOPUS PLUMBEUS, Wied.

Hitherto recorded only from Trinidad in the West Indies.

5. TRIGONOCEPHALUS LANCEOLATUS, Daud.

II. St. Lucia.

Collected by Mr. Ramage.

1. Hemidactylus mabouia, Mor.

2. Thecadactylus rapicauda, Houtt.

3. Sphærodactylus microlepis, R. & L.

We have stated above that the male specimen from Dominica bears no other markings but a few light dots. The St. Lucia specimens, although agreeing entirely in structure with the above, differ in having a black interscapular band, which may be preceded by a pair of whitish spots; this black band is usually edged with lighter behind. But then the Dominica specimens again differ among themselves; some have large black or dark brown symmetrical markings or angular bands on the head and nape, and V-shaped black bands on the throat, whilst others have a uniform pale brown head and a white throat. These differences are not sexual, the head-markings only being not so dark in the females as in the males. Dark spots or cross-bands may be present on the back.

This is evidently the most widely distributed of the West-Indian *Sphærodactyli*, since it is now known from St. Croix (*Lütken*), Dominica, and St. Lucia.

4. Anolis alligator, D. & B.

Anolis luciæ, Garman, Bull. Essex Inst. xix. 1887, p. 34.

5. Gymnophthalmus pleii, Bocourt.

Like Mr. Garman I find the St. Lucia specimens to be referable to *G. pleii*, described by Bocourt as from Martinique, and not to *G. luetkenii*, of the same author, from St. Lucia.

6. Mabuia agilis, var. luciæ, Garm.

Mabuia luciæ, Bull. Essex Inst. xix. 1887, p. 51.

This form must be regarded as a variety of *M. agilis*. The four specimens obtained by Mr. Ramage differ from the typical form of this species in having two or three pairs of nuchals; but as Mr. Garman says in his description "one or two pairs of nuchals," it is clear the character is not constant. The black lateral band is absent, as in a specimen from Barbados. In one specimen the frontonasal is in contact with the rostral; in the three others, the internasals are in contact behind the rostral. Two specimens are males; they have 28 scales round the middle of the body, 59 and 63 from chin to vent: the two others are females, and have 30 scales round the body, 64 and 69 from chin to vent.

7. Liophis fugitivus, Donnd.

Dromicus ornatus, Garman, Proc. Am. Philos. Soc. xxiv. 1887, p. 280.

Inhabits Guadeloupe, Martinique, and St. Lucia. Our specimens from St. Lucia have 188–196 ventrals and 82–89 subcaudals. The Cuban *Dromicus cursor* of Bibron (in R. de la Sagra) is a distinct but allied species, *Liophis andreæ*, R. & L., recently renamed *Dromicus cubensis* by Garman. These two forms cannot be generically separated from *Liophis*, Wagl. (type *L. reginæ*, L.). The genus *Dromicus*, Bibr., of which I take *D. angulifer*, Bibr., to be the type, may be distinguished by its enlarged anterior mandibular teeth.

8. Oxyrhopus plumbeus, Wied.

9. Leptodactylus pentadactylus, Laur.

10. Hyla rubra, Daud.

This appears to be the first record of this South-American Tree-Frog in the West Indies. Two female specimens were sent by Mr. Ramage.

III. St. Vincent.

Collected by Mr. H. H. Smith.

1. Hemidactylus mabouia, Mor.

2. Thecadactylus rapicauda, Houtt.

3. Sphærodactylus vincenti, sp. n.

Snout acutely pointed, as long as the distance between the eye and the ear-opening, once and a half the diameter of the orbit; ear-opening small, roundish. Rostral large, with longitudinal cleft above; nostril pierced between the rostral, the first labial, and two scales; three upper and three lower labials; mental large, its posterior border truncate and in contact with two or three scales. A small spine-like scale on the upper eyelid, above the middle of the eye. Upper head-scales small, keeled, largest on the snout. Dorsal scales moderately large, rhomboidal, juxtaposed, keeled, larger on the sides, where they are about half the size of the ventrals; latter hexagonal, imbricate, smooth; 55 to 60 scales round the middle of the body. Tail cylindrical, tapering; upper caudal scales pointed and keeled; a series of enlarged subcaudal shields. Brown above, head lighter; a pale, dark-edged V-shaped marking may be present at the base of the tail; lower parts pale brown, the scales edged with darker; tail coral-red, all over or only on the lower surface.

	millim.
Total length	55
Head	8
Width of head	5
Body	20
Fore limb	8
Hind limb	10
Tail	27

Several specimens were obtained in damp forest, under rotting leaves.

4. Anolis alligator, D. & B., var. vincenti, Garm.
Anolis vincentii, Garm. Bull. Essex Inst. xix. 1887, p. 46.

5. Anolis richardii, D. & B.
Anolis griseus, Garm. l. c. p. 36.

6. Iguana tuberculata, Laur.

7. Ameiva surinamensis, Laur.
Ameiva aquilina, Garm. l. c. p. 3.

8. Mabuia aurata, Schn.
Mabuia ænea, Gray, Garman.

Two specimens. These have the supranasals separate, as described by Garman; but these shields are in contact with each other in the type specimen of *M. ænea* from St. Vincent. The keels on the scales almost obsolete.

9. Xiphosoma hortulanum, L.

10. Coluber boddaertii, Sentz.
Ventrals 192, 200; subcaudals 92, 120.

11. Herpetodryas carinatus, L., var. vincenti.

More slender than the type. Ventrals 168, 166; subcaudals 155, 148. Three postoculars; temporals 1+2; three labials entering the eye. Blackish brown or black above; upper lip and gular region yellowish; belly plumbeous or blackish.

Continental specimens of this species have usually 145–160 ventrals, 125–140 subcaudals, and two postoculars. However, as we have in the British Museum a specimen from Venezuela with 164 ventrals and 171 subcaudals which is otherwise not separable from *H. carinatus*, I must regard the St. Vincent specimens as referable to a variety rather than to a distinct species. Specimens from Guadeloupe and Trinidad do not differ from the typical *H. carinatus*.

Five species of *Herpetodryas* may be distinguished, as shown by the following synopsis:—

I. Scales in 12 rows; anal usually divided.	
Four or more rows of scales keeled	1. *sexcarinatus*, Wagl.
Scales smooth, or only the two middle rows keeled	2. *carinatus*, L.
II. Scales in 10 rows.	
Anal entire; scales smooth, or only the two middle rows keeled	3. *fuscus*, L.
Anal divided; scales smooth	4. *melas*, Cope.
Anal divided; scales keeled	5. *grandisquamis*, Ptrs.

12. Hylodes martinicensis, Tsch.

13. Leptodactylus caliginosus, Gir.
Leptodactylus validus, Garm. l. c. p. 14.

IV. Becquia and Moustiques, Grenadines.

Collected by Mr. H. H. Smith.

1. Hemidactylus mabouia, Mor. Becquia.

2. Anolis alligator, var. gentilis, Garm. Becquia.
Anolis gentilis, Garm. l. c. p. 34.

3. Xiphosoma hortulanum, L. Becquia.

4. Coluber boddaertii, Sentz. Moustiques.
Ventrals 198; subcaudals 117.

List of Fishes obtained in Fresh Water on Dominica and St. Vincent.

I. Dominica.

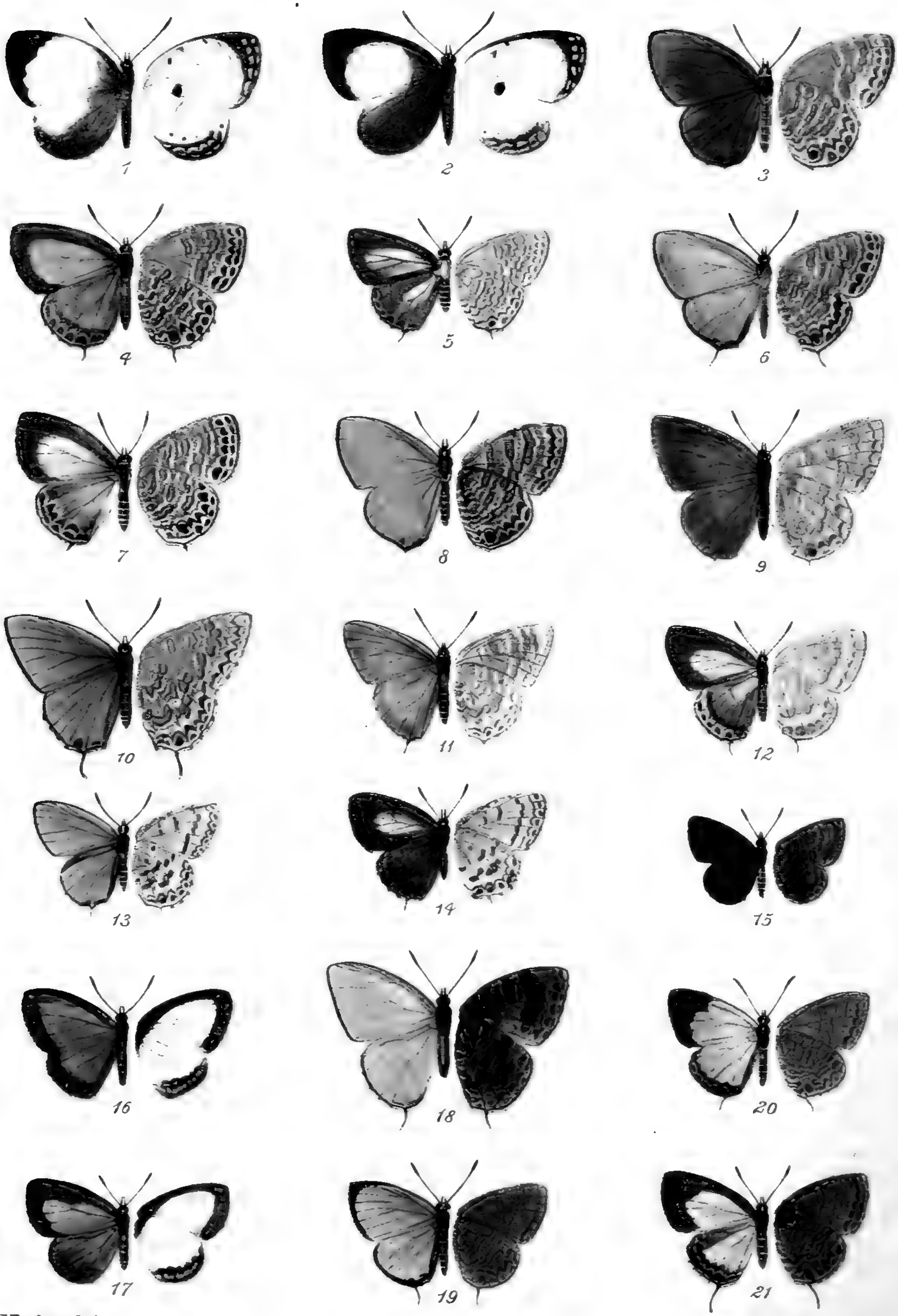
Collected by Mr. G. A. Ramage and Dr. H. A. A. Nicholls. Presented to the British Museum by the West Indies Exploration Committee.

1. Pristipoma crocro, C. & V.
2. Sicydium plumieri, Bl.
3. Eleotris dormitatrix, Bl. Schn.
4. Eleotris gyrinus, C. & V.
5. Gobiesox cephalus, Lacép.
6. Agonostoma monticola, Bancr.
7. Anguilla latirostris, Risso.

II. St. Vincent.

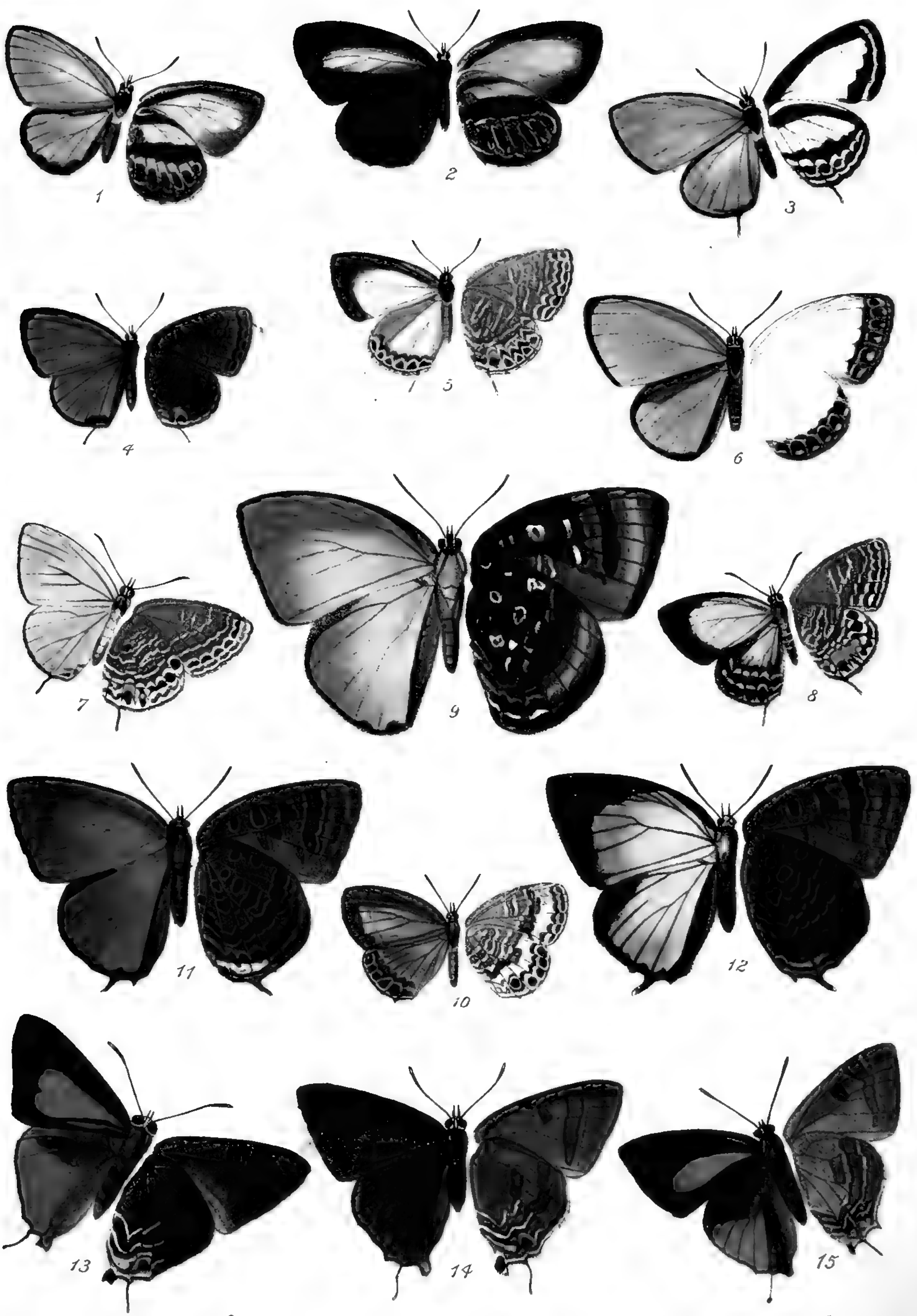
Collected by Mr. H. H. Smith. Presented to the British Museum by Mr. F. D. Godman.

1. Mesoprion griseus, C. & V.
2. Pristipoma crocro, C. & V.
3. Gerres rhombeus, C. & V.
4. Gerres argenteus, B. & G.
5. Sicydium plumieri, Bl.
6. Gobius banana, C. & V.
7. Eleotris dormitatrix, Bl. Schn.
8. Eleotris gyrinus, C. & V.



W. Purkiss lith. Hanhart imp.

LYCÆNIDÆ OF THE SOLOMON ISLANDS.



W. Purkiss lith.

Hanhart imp.

LYCÆNIDÆ OF THE SOLOMON ISLANDS.

9. Gobiesox cephalus, Lacép.

10. Mugil brasiliensis, Ag.

11. Agonostoma monticola, Bancr.

12. Citharichthys spilopterus, Gthr.

13. Solea inscripta, Gosse.

14. Anguilla latirostris, Risso.

4. On the *Lycænidæ* of the Solomon Islands. By Hamilton H. Druce, F.E.S.

[Received May 19, 1891].

(Plates XXXI. & XXXII.)

The present list is based on a large number of these Butterflies obtained in the Solomon Islands by Mr. C. M. Woodford, and now in Messrs. Godman and Salvin's collection, to which are added some few collected by Mr. Gervase Mathew, R.N. The large majority of the species are peculiar to these islands, whilst some few, such as *Lycænesthes emolus*, Godt., *Zizera gaika*, Trimen, and *Tarucus plinius*, Fabr., have, as is well known, a very extended range. Forty-two species are here enumerated, 21 of which I have described as new. The type-specimens are all in Messrs. Godman and Salvin's collection.

Hypochrysops, Feld.

Hypochrysops cratevas.

Hypochrysops cratevas, H. H. Druce, Trans. Ent. Soc. 1891, p. 191, pl. x. ff. 16–18, pl. xi. f. 16.

Aola, Guadalcanar I.

Hypochrysops architas.

Hypochrysops architas, H. H. Druce, Trans. Ent. Soc. 1891, p. 191, pl. x. ff. 2, 3.

Fauro I.

Hypochrysops seuthes.

Hypochrysops seuthes, H. H. Druce, Trans. Ent. Soc. 1891, p. 192, pl. xi. ff. 4, 5.

Uru Bay and Tyoh, Malaita I.

Hypochrysops alyattes.

Hypochrysops alyattes, H. H. Druce, Trans. Ent. Soc. 1891, p. 193, pl. xi. ff. 6–8.

Aola, Guadalcanar I.

Pithecops, Horsf.

Pithecops dionisius. (Plate XXXI. fig. 1.)

Lycæna dionisius, Boisd. Voy. Astr., Lep. p. 82. n. 11 (1832).

Alu I., near Shortland I. Fauro I. Florida I. Treasury I. (*Mathew*).

Mr. Woodford's collections contain a large number of specimens agreeing with those from N. Guinea. The first subcostal nervule in this species is not anastomosed with the costal nervure to anything like the extent that it is in the type of the genus (*P. hylax*, Fabr.). I have figured a specimen from Alu I.

Pithecops dionisius, var. steirema. (Plate XXXI. fig. 2.)

Pithecops steirema, H. H. Druce, Ann. Mag. Nat. Hist., Jan. 1890, p. 25.

Savo I. Aola, Guadalcanar I.

This form, which is distinguished from the preceding by having scarcely any white on the hind wing, seems to be confined to the two islands as noted above.

Zizera, Moore.

Zizera phœbe.

Zizera phœbe, Murray, Ent. Mo. Mag. x. p. 107 (1873).

Alu I., near Shortland I. St. Anna I., near San Christoval I. Ugi I. (*Mathew*).

Several specimens agreeing well with the typical specimens from Australia.

Zizera gaika.

Zizera gaika, Trimen, Trans. Ent. Soc. 1862, p. 403.

Alu I., near Shortland I. Guadalcanar I. N.W. Bay, Malaita I. Ulaua I. Treasury I. (*Matthew*).

It seems to be a generally accepted fact that *Z. pygmæa*, Snell., is a synonym of *Z. gaika*, otherwise I should have placed these specimens under the former name.

Lycænesthes, Moore.

Lycænesthes emolus.

Lycænesthes emolus, Godt. Enc. Méth. ix. p. 656. n. 133 (1823).

Alu I., near Shortland I. Guadalcanar I. Uru Bay, Malaita I.

Both sexes of this insect, which it is impossible to separate from the Indian and Australian species.

Talicada, Moore.

Talicada cleotas.

Polyommatus cleotas, Guér. Voy. Coq. t. 18. f. 4 (1829).

Alu I., near Shortland I. Fauro I. Rubiana I. St. Anna I.

Several specimens agreeing well with examples from N. Ireland.

Nacaduba, Moore.

All the species here included in this genus have the first branch of the subcostal nervure completely anastomosed with the costal nervure for a more or less considerable distance, and it would seem that this fact may prove to be of much value in determining closely allied species. For instance, *N. felderi*, Murray, is stated by Mr. de Nicéville (Butt. India &c. iii. p. 147), following Herr Semper, to be a synonym of *N. nora*, Feld.; but in *N. nora* (from Sikhim) the first subcostal nervule is anastomosed with the costal nervure for a distance rather less than equal to its length from the subcostal nervure to where it joins the costal nervure, whilst in *N. felderi* it is anastomosed nearly four times this length. The type of *N. nora* is from Amboina, and it seems possible that the Indian insect is wrongly identified.

Nacaduba astarte. (Plate XXXII. fig. 10 ♀.)

Lampides astarte, Butl. Ann. Nat. Hist. (5) x. p. 150 (1882).

Alu I., near Shortland I. Fauro I. N.W. Bay, Malaita I.

Several specimens (♀) agreeing well with Mr. Butler's type in the British Museum from New Britain.

There is a male of what I believe to be this species in Messrs. Godman and Salvin's collection, which on the upperside is a silky brownish blue, and on the underside has the conspicuous white bands somewhat narrower than the type, and also the specimens referred to above. It is from the Duke of York I. The specimen figured is from Fauro I.

Nacaduba plumbata, sp. n. (Plate XXXI. figs. 3 ♂, 4 ♀.)

Male. Allied to *N. macrophthalma*, Feld. Upperside dark violaceous blue, with the margin narrowly, and cilia dark blackish brown, the outer margin of primaries more rounded, and in that respect resembling *N. herms*, Feld., from Amboina. Underside light brownish grey, with all the macular markings and lunules slightly darker and bordered outwardly with pure white. The fore wing slightly, and the hind wing extensively, suffused with bright emerald-green scales at the base. Primaries with a rather narrow band at the end of the cell, and beyond that at about halfway between it and the outer margin a continuous unbroken macular band of about equal width as far down as the median nervure, below that gradually widening inwardly to the submedian nervure; beyond this band a submarginal row of darker crescent-shaped lunules enclosing a marginal row of large indistinct spots. Secondaries with a basal band, broadest on the costa, another near the end of the cell, and beyond that, commencing rather beyond the middle of the costa, a very irregular much-broken macular band reaching to the inner margin, that part of it which is opposite the short band near the end of the cell being placed nearer to the outer margin, so that its inner border runs in a line with the outer border of its continuations. Beyond this band a submarginal row of darker crescent-shaped lunules enclosing large distinct spots. Supposing, as I do, that the median nervule is continued to the margin, there is a large deep black spot narrowly bordered inwardly with pale orange, and outwardly with brilliant metallic light blue, between the first and second branches; also a lengthened black spot at the anal angle thickly covered with blue scales, and bordered inwardly with a minute orange spot, which, however, is not always present.

Female. Dull blackish brown. Primaries of a lighter and more brilliant violaceous blue in the discal area, and the costal and outer margins evenly and broadly bordered. Secondaries with a few blue scales scattered over the surface, and a marginal row of large black lunules, largest towards the anal angle, very narrowly bordered with greyish blue. Underside as in male.

Head, thorax, and abdomen concolorous with wings; antennæ black above, spotted with white beneath.

Expanse, ♂ ♀ $1\frac{1}{10}$–$1\frac{3}{10}$ inch.

This species has a short black tail with a white tip on the lower median nervule.

Guadalcanar I. Tyoh, Malaita I. Ulaua I.

The blue on the females from Ulaua I. has almost entirely disappeared, and in specimens both from Malaita I. and Ulaua I. the orange near the anal angle on underside of hind wings is replaced by white.

The markings on the underside, although arranged much as in *N. macrophthalma*, are much more distinct than in that species. It is also a smaller insect.

NACADUBA UGIENSIS, sp. n. (Plate XXXI. fig. 5.)

Female. Allied to *N. plumbata.* Disks of upper surface suffused with a lighter and more brilliant blue. Underside much paler, and with bases of both wings much more strongly suffused with light bluish-emerald-green. Expanse same as *N. plumbata.*

Ugi I. (*Mathew*).

Messrs. Godman and Salvin's collection contains three specimens obtained by Mr. Mathew, but Mr. Woodford does not seem to have met with any. The pale colour and strong suffusion of green on the underside gives the species a remarkable appearance.

NACADUBA EURETES, sp. n. (Plate XXXI. figs. 6 ♂, 7 ♀.)

Male. Allied to *N. prominens*, Moore. Upperside much more brilliant violaceous silvery-blue, with the brown margins broader. Underside with markings much as in *N. prominens*, but the submarginal row of lunules on both wings very large, triangular, and much darker than the bands.

Female. Dark greyish brown, with the disk of the primaries brilliantly suffused with light blue.

Head, thorax, and abdomen concolorous with body. A short brown tail tipped with whitish.

Expanse, ♂ $1\frac{2}{5}$–$1\frac{1}{5}$ inch, ♀ $1\frac{1}{5}$–$1\frac{1}{10}$ inch.

Aola, Guadalcanar I. N.W. Bay, Malaita I. Fauro I. Rubiana I. Ulaua I.

This species can be immediately distinguished from the preceding by its having an additional band in the centre of the cell below, which is also continued downwards nearly to the inner margin.

NACADUBA KORENE, sp. n. (Plate XXXI. fig. 8.)

Male. Allied to *N. euretes*, but all the bands on underside narrower, and bordered outwardly with sordid white, not pure white as in that species. The submarginal row of lunules is only slightly darker than other parts of wings. Expanse srme as *N. euretes.*

Aola, Guadalcanar I. Opposite Ugi, San Christoval I.

This form may prove to be a variety of the preceding, but in a long series of specimens there do not appear to be any intermediates.

NACADUBA AMAURA, sp. n. (Plate XXXI. fig. 10.)

Male. Allied to *N. ancyra*, Felder, from Amboina and Aru, from which it principally differs by having the bands on the underside much more irregular, and by the submarginal row of crescent-shaped lunules being large and dark, and by the greater preponderance of white in the ground-colour, and by being grey in place of brown.

Female. Upperside dull greyish brown, the disk of the fore wing suffused with blue; hind wing slightly bluish, with a distinct marginal row of grey-bordered lunules, that one between the median nervules being darker and bordered inwardly with orange. Underside browner than in male, and more strongly diffused with white.

A short black tail white-tipped, and white below.

Expanse, ♂ $1\frac{2}{5}$ inch, ♀ $1\frac{1}{10}$ inch.

Alu I., near Shortland I. Rubiana I. Malaita I.

This may prove to be a variety of *N. ancyra*, Feld., as it is somewhat variable, but amongst the specimens before me are none which agree well with it.

NACADUBA MANIANA, sp. n. (Plate XXXI. fig. 9.)

Male. Allied to the preceding, but a darker shade of blue on the upperside. Underside with all bands bordered with sordid white, having altogether a much duller appearance, and with the marginal row of lunules in the fore wing entirely gone, and the submarginal very indistinct. Expanse $1\frac{3}{10}$ inch.

Ulaua I.

Several specimens not showing any variation.

NACADUBA LIGAMENTA, sp. n. (Plate XXXI. figs. 11 ♂, 12 ♀.)

Male. Upperside shining violaceous blue; cilia brown. Underside with light brown bands, bordered with pure white on a greyish-white ground. Primaries with a band in the middle of the cell, another at the end, and beyond that, reaching from the costa to the submedian nervure, a rather narrow macular band; a marginal row of exceedingly minute indistinct lunules, and a submarginal row of very narrow crescent-shaped lunules. The bands on the hind wing arranged much as in *N. amaura* and other allies, and the lunules as in fore wing.

Female. Upperside as *N. amaura.* Underside pure white, so that the borders to the light brown bands described in the male are invisible, and the submarginal rows of lunules appear more distinct.

Head, thorax, and abdomen brownish, antennæ annulated with white; legs white, with a few black spots.

Expanse, ♂ ♀ $1\frac{1}{5}$ inch.

Ugi I.

This species may be readily distinguished from its allies by the white appearance of the underside.

NACADUBA KEIRIA, sp. n. (Plate XXXI. figs. 13 ♂, 14 ♀.)

Male. Upperside dark lavender-blue, with two or three large indistinct triangular marginal black spots at the anal angle of hind wing; cilia dark brown. Underside clear greyish white, suffused at the base with bright green and with all the markings well defined. Fore wing with two small blackish dashes about the middle of the cell, one above the other, having their respective bases, one on the upper and one on the lower wall of the cell; a long narrow light brownish streak at the end of the cell and beyond that an irregular band, the upper part consisting of separated spots, the lower usually being a thickened streak; beyond this is a darker, submarginal, zigzag line and a marginal row of somewhat triangular dusky lunules. Hind wing with three black, white-ringed, distinct spots encircling the base, viz. one on the costa, one about the middle, and one on the inner margin close to the base; a rather long narrow band at the end of the cell, bent outwards; beyond these, commencing with a dark spot on the costal margin, a much-broken light brown band, consisting of darker-edged, irregular, confluent spots reaching to the submedian nervure, beyond this a submarginal irregular line enclosing a marginal row of large greyish-brown lunules; a black spot between the first and second median nervules broadly bordered inwardly with reddish orange; a short black line on the anal margin near the end of the abdomen. The outer margins of both wings very narrowly black; cilia greyish white.

Female. Upperside greyish brown. Primaries with the disk very slightly suffused with light blue scales. Secondaries with a rather large outer-marginal row of slightly darker lunules, bordered inwardly with greyish and outwardly with a very fine greyish line, the two anal lunules being darkest. Underside as in male, but ground-colour rather browner and less green at base.

Head, thorax, and abdomen concolorous with wings; legs white with black spots. Antennæ black, annulated with white. A short black tail margined and tipped with white.

Expanse, ♂ ♀ $1\frac{1}{20}$–$1\frac{1}{5}$ inch.

Alu I., near Shortland I. Aola, Guadalcanar I. N.W. Bay, Malaita I. Tyoh, Malaita I. Fauro I. Florida I.

The only difference I can detect in a good series of specimens is a slight one in the size of markings below.

NACADUBA DION, Godt. Enc. Méth. ix. p. 655 (1823).

Rubiana I. Ugi I.

The four specimens before me are females, and without seeing a male I think it better not to describe them as a new species. They seem to differ slightly from that sex of *N. dion* from N. Australia by having two large black spots with broad orange borders and metallic silvery-blue scales at the anal angle of hind wing below.

NACADUBA VINCULA, sp. n. (Plate XXXI. fig. 18.)

Male. Upperside dull light greyish blue, having a hairy appearance like *C. platissa*, Herr.-Schäff., very narrowly edged with black; cilia greyish, darker at ends of nervules. Underside rich dark chocolate-brown, with darker white-bordered bands. Primaries with a band in the middle of the cell, commencing on the costa and reaching below the median nervure; a rather wider band at the end of the cell having a small lengthened spot on the costa immediately over it; beyond these a somewhat irregular semicircular macular band commencing on the costa, gradually widening to opposite the cell and reaching to the submedian nervure, where it is narrowest; the ground-colour outside the inner edge of this band suffused with white scales; a large marginal row of oval lunules with a faint grey line running through them. Secondaries blackish at the base; an irregular basal band and beyond this, commencing on the costa, another which may be said to end on the median nervure, beyond this another which commences on the subcostal and gradually narrowing reaches the anal margin about the end of the abdomen; a submarginal row of triangular lunules and a marginal row of oval lunules encircled with white; a large reddish-orange spot near the anal angle bordering inwardly a small black spot partly covered with metallic green scales.

The outer margins of both wings very narrowly black; cilia as above.

Head, thorax, palpi, and legs black; antennæ annulated with white. Abdomen brownish above, light buff below. Eyes densely hairy, with a pure white spot between them.

Expanse $1\frac{2}{5}$ inch.

Fauro I.

I have only seen one specimen of this fine insect, which is allied to *N. lineata*, Murray, N. Australia, and *N. palmyra*, Feld. It may be distinguished from the male of *N. lineata* (which I have seen nowhere described) by its larger size, by the different colour, and prominent white borders to the bands below, and by the outer margin being rounded, not nearly straight as in that species.

It is probable that the female will prove to have a broad white band on the primaries. I have examined the neuration of these species, and find that the first subcostal nervure is anastomosed with the costal nervure much as in typical *Nacaduba*. The following is a short description of *N. lineata*, Murray:—*Male.* Upperside brownish silvery blue, browner at apex. Underside chestnut-brown, with bands much as in *N. vincula*, but narrower and not bordered with white as in the female.

Thysonotis, Hübn.

I have followed Herr Semper in using Hübner's name for this group. There is apparently nothing but what Mr. de Nicéville calls "facies" to distinguish it from *Nacaduba*.

Thysonotis kruera, sp. n. (Plate XXXI. figs. 16 ♂, 17 ♀.)

Male. Upperside dark violaceous blue, narrowly margined with dark brown; cilia dark brown. Underside pure white, with costal and outer margins of primaries dark brown, broadest at the base. Secondaries brown at the base and the outer margin, on which is a row of small, irregular, metallic blue spots with a few scales above them towards the anal angle; a few metallic scales near the base just outside the brown.

Female. Upperside dull greyish brown, with the disk, from the base, dull light violaceous blue; hind wing with the outer margin darkest, slightly bluish towards the base. Underside as in male.

Head and thorax dark brown; abdomen brown, annulated with white as the bases of the segments; antennæ and legs dark brown spotted with white.

Expanse, ♂ ♀ $1\frac{1}{10}$ inch. No tail.

Florida I. (♂). N.W. Bay, Malaita I. (♀).

This species is allied to *T. hymetus*, Feld., from Amboina, but is darker blue above, and the female is very different, and to *T. piepersii*, Snellen, from Celebes.

Thysonotis cepheis, sp. n. (Plate XXXII. figs. 1 ♂, 2 ♀.)

Male. Upperside silky violaceous blue, with the margins narrowly and evenly black; lighter in the disk of the fore wing. Underside allied to *T. schaeffera*, Esch., but suffused with more brilliant green at the bases and with the outer-marginal band enclosing the black spots, which in that species is light buff, brilliant metallic green.

Female. Upperside as in *T. schaeffera*, Esch., female. Underside as in male.

Head and palpi greenish white; thorax and abdomen brown; legs brown and white.

Expanse, ♂ $1\frac{3}{10}$–$1\frac{1}{2}$ inch, ♀ $1\frac{7}{10}$ inch.

Aola, Guadalcanar I.

In some specimens the outer border only of the band on the underside of hind wing is metallic green, the inner border being buff as in *T. schaeffera*, Esch.

T. cepheis can be at once distinguished from that species by the upperside of male being almost entirely blue, in that respect resembling another allied species, viz. *T. calydonica*, Feld., from New Caledonia, which has been placed as a synonym of *T. schaeffera* by

M. Semper and others; but on the underside it is a brilliant metallic golden yellow, which is not shown in Felder's figure.

THYSONOTIS CHROMIA, sp. n. (Plate XXXII. fig. 3.)

Male. Upperside silky violaceous blue, costa and outer margins very narrowly and evenly black; cilia black; tail black, tipped with white. Underside: fore wing creamy white, with the costal margin broadly black; outer margin narrowly black near apex, gradually widening towards outer angle; an indistinct marginal whitish line, and a distinct submarginal white line thickening at each nervule. Hind wing: costa pure white from the base, gradually tapering towards the apex; below that a broad black band between the costal and subcostal nervures reaching from the base to the apex; below this a broad white band from the inner margin running to a point at the apex, even on its upper edge, zigzag on its lower; following this a rather broad black band, and again beyond this a submarginal row of black lunules bordered inwardly with large white crescent-shaped lunules; the four lower ones being more or less covered with brilliant shining cærulean-blue scales. A rather broad distinct white marginal line from the apex to the anal angle, intercepted with black at each nervule.

Head, thorax, and abdomen concolorous with wings; antennæ black, annulated with white; legs black and white.

Expanse $1\frac{7}{10}$ inch.

Fauro I. Maravo I.

I have not seen the female of this insect. It is allied to *T. sperchius*, Feld., but has many points of distinction.

The specimen figured is from Fauro I.

EPIMASTIDIA, gen. nov.

Allied to *Thysonotis*; neuration the same; antennæ somewhat more slender and more gradually clavate. Upperside of hind wing with subcostal nervure clothed from base for about two-thirds its length with long slender hairs. Underside with no metallic spots or markings.

Type *Lycæna inops*, Feld.

In the British Museum collection *E. inops* is placed in the genus *Pithecops*, with which it also agrees in neuration, but I think from its general appearance it is more nearly allied to *Thysonotis*. It may perhaps be found convenient to retain the name *Danis* for the group of which the *Papilio danis*, Cr., is the type, as they seem to be coarser-scaled and more robust insects.

Epimastidia contains tailless insects, *Thysonotis* tailed and tailless, and *Danis* tailless species.

EPIMASTIDIA ARIENIS, sp. n. (Plate XXXII. fig. 6.)

Male. Upperside uniform shining cærulean blue, with the outer margins of both wings rather narrowly blackish brown; hind wing with the costal third whitish brown, lighter towards the margin. Underside pure creamy white, with the outer margins of both wings rather broadly and evenly bordered with brown, down the centre of which is a marginal row of large black lunules, indistinctly bordered inwardly with whitish and outwardly with distinct white spots, some of which appear slightly bluish.

Head, thorax, and abdomen blackish above, white beneath.

Expanse $1\frac{3}{4}$ inch.

Florida I.

I have before me three males of this beautiful species, which is allied to *E. inops*, Feld., from Aru; but it appears to be of a more brilliant shade of blue than specimens of that species, and on the underside is distinguished by being entirely without the broad brown border to the costal margin of fore wing, and the brown ultra-median band to the hind wing.

Prosotas, gen. nov.

Allied to *Nacaduba* and allied genera, from which it differs by having the first branch of the subcostal nervure very short, reaching only to the costal nervure, which it joins, and disappears.

Type *P. caliginosa*, mihi.

Prosotas caliginosa, sp. n. (Plate XXXI. fig. 15, ♂.)

Male. Upperside dark greyish brown, rather darker at the margins; slightly shining violaceous in the disks, especially of the hind wing; cilia light brown. Underside dark brownish grey, with bands and lunules edged with sordid white, much as in *N. ardates*, Moore, but having the submarginal row of lunules on both wings large, indistinct, and darker than any other portions of the wing. On the hind wing, near the anal angle, is a large black spot inwardly edged with orange.

Female. Upperside uniform dull greyish brown, of a lighter shade than male. Underside as in male but paler.

Head, thorax, and abdomen brownish; legs brown with small white spots; antennæ brown annulated with white.

Expanse $\frac{4}{5}$ inch, ♂ ♀.

Alu I., near Shortland I. Aola, Guadalcanar I. Rubiana I. Malaita I.

I have compared this species to *N. ardates*, Moore, but on the upperside it has a very different appearance, somewhat resembling some specimens of the European *Lycæna alsus*.

It is possible that this is the *Lycæna alsulus*, Herr.-Schäff., but it does not seem to fit the description.

Lycæna biocellata, Felder, from Australia, possibly belongs to this genus, but I have no specimen for examination.

Jamides, Hübn.

Jamides amarauge, sp. n. (Plate XXXI. figs. 20 ♂, 21 ♀.)

Male. Upperside brilliant shining silvery light blue, greenish in some lights; primaries with apex and outer margin broadly blackish brown; secondaries with the outer margin brown-bordered and a distinct marginal row of grey-circled lunules, largest at the anal angle; inner margin light brown. Underside rather dark greyish brown, with indistinct bands and lunules edged with sordid white. Primaries: a band at the end of the cell and beyond that a broad band commencing on the costa, running in semicircular form to the first branch of the median nervure, where it touches the short band at the end of the cell, and then continues nearly to the submedian nervure, where it ends, beyond this a marginal and a submarginal row of faint lunules. Secondaries with three indistinct much-broken macular bands, the first near the base, second rather before the middle, and the third rather beyond, these last two converging into one near the anal margin, beyond these an indistinct submarginal row of crescent-shaped lunules enclosing a marginal row of circular lunules. A large black orange-bordered spot near the anal angle.

Female similar to male, but without the gloss and of a slightly more bluish tinge and with less green on the costa. Underside as in male, but white rather more prominent.

Head, thorax, abdomen, and short tail greyish brown; palpi and legs whitish.

Expanse, ♂ $1\frac{1}{5}$ inch, ♀ $1\frac{1}{5}$–$1\frac{1}{10}$ inch.

Alu I., near Shortland I. Guadalcanar I. Florida I.

This species may be distinguished from its allies by its pale coloration. There is scarcely any difference between the sexes, except that the male is metallic and the female duller blue.

JAMIDES SŒMIAS, sp. n. (Plate XXXII. figs. 4 ♂, 5 ♀.)

Allied to *J. woodfordii*, Butl.

Male. Upperside rich dark shining purple, with the apex of fore wing very narrowly black; cilia black. Underside much as in species mentioned, but the ground-colour of the white-bordered bands generally of a darker shade than the rest of the wing, and the submarginal rows of crescent-shaped lunules large and distinct.

Female. Scarcely distinguishable from that sex of *J. woodfordii*, but the marginal row of lunules on the hind wing larger and more distinct. Underside as in male.

Expanse $1\frac{3}{10}$ inch.

Alu I., near Shortland I. Fauro I. Florida I. N.W. Bay, Malaita I.

This species can be at once distinguished from its allies by its dark purple coloration. I think that there can be no doubt that Mr. Butler's *J. campanulata* is a synonym of his *J. woodfordii*. I have before me some 36 specimens of this form from the Fiji Islands, varying in size from $\frac{4}{5}$ inch to $1\frac{1}{5}$ inch, and having the submarginal line noted by Mr. Butler as a principal distinction varying from blue to white, and in some cases disappearing altogether.

JAMIDES CEPHION, sp. n. (Plate XXXI. fig. 19.)

Male. Brilliant morpho blue, with emerald-green reflexions; apex and outer margin narrowly black above, equal to that of *J. sœmias*. Inner margin of hind wing densely black. Tail black, not tipped with white. Underside much as in *J. woodfordii*, but rather darker and the black spot over the tail larger and bordered inwardly with a broader band of dark red, not orange.

Expanse $1\frac{1}{10}$ inch.

Aola, Guadalcanar I.

This species is perhaps nearest to *J. morphoides*, Butl., from New Hebrides, but is even more brilliant, and has much narrower borders.

Lampides, Hübn.

Lampides aratus.

Papilio aratus, Cr. Pap. Exot. iv. t. 365, A, B (1782).

Lampides cœrulina, Mathew, Trans. Ent. Soc. Lond. 1887, p. 46.

Alu I., near Shortland I. Fauro I. Guadalcanar I. Ugi I.

The types of Mr. Mathew's species (now in Messrs. Godman and Salvin's collection) are stated (*loc. cit*) to be allied to *L. ælianus*, Felder, but they are not in any way distinguishable from Cramer's species from Amboina and Ceram.

Lampides evanescens, Butl. P. Z. S. 1875, p. 615.

Alu I., near Shortland I. Fauro I. Maravo I. Florida I. Aola, Guadalcanar I. Cape Astrolabe, Malaita I. Opposite Ugi, San Christoval I. Ugi I. St. Anna I. Ulaua I.

I have before me a large series of this species which shows considerable variation as to the breadth of the black border to the primaries above, and as to all the other distinctions pointed out by Mr. Butler (*loc. cit.*), excepting that the wings do certainly appear somewhat shorter than Indian specimens of *L. ælianus*, Fabr. There are examples from most of the localities which agree well with the types and other specimens in Messrs. Godman and Salvin's collection from New Hebrides Islands.

There can be no doubt that *L. ælianus*, Auct., is a synonym of *L. celeno*, Cr., the type of which is, of course erroneously, stated to have come from Surinam.

Lampides areas, sp. n. (Plate XXXII. figs. 7 ♂, 8 ♀.)

Male. Upperside uniform light cobalt-blue, outer margins very narrowly black. Underside much like *L. aratus*, Cr., but the ground-colour of both wings dark greyish in place of brownish, and all the white markings narrower; the black sagittate lunules on hind wing being less distinct and somewhat smaller, and the upper black apical spot being much the largest, the reverse being the case in *L. aratus*.

Female. Upperside: fore wing blue as in male, with the costa very narrowly and the apex and outer margin broadly black. Hind wing slightly suffused with blue from the base to rather beyond the middle, bordered with a distinct row of bluish-white spots, beyond which and between the marginal row of deep black oval lunules, which are bordered inwardly and near the anal angle outwardly with bluish white, the wing presents a decided cupreous appearance, which is caused by the abnormal quantity of orange on the underside showing through. Underside as in male, but with a large patch of orange on hind wing reaching from the submedian nervure almost to the apex.

Both sexes with a short streak of silvery blue on each side of the median nervules and the submedian nervure near the margin.

Expanse, ♂ $1\frac{2}{5}$–$1\frac{1}{2}$ inch, ♀ $1\frac{1}{5}$–$1\frac{2}{5}$ inch.

Alu I., near Shortland I. Aola, Guadalcanar I.

This species is similar to *L. coruscans*, Moore, on the upperside, but differs in having the black margins reduced to a narrow line; the fore wing also being broader, and the hind wing more produced apically.

Catochrysops, Boisd.

Catochrysops cnejus, Fabr. Ent. Syst. Supp. p. 430 (1798).

Alu I., near Shortland I. Guadalcanar I. Florida I.

Mr. Woodford's collections contained several specimens of this wide-ranging species.

Catochrysops platissa, Herrich-Schäffer, Stett. ent. Zeit. vol. xxx. p. 74, pl. iv. fig. 20 (1869), ♀.

Alu I., near Shortland I. Aola, Guadalcanar I. N.W. Bay, Malaita I. Fauro I. (♀).

Specimens from these islands agree well with several from the New Hebrides in the British Museum sent by Herrich-Schäffer under his name, and I think that both Herr Semper and Mr. de Nicéville are wrong in placing it as a synonym of *C. strabo*, Fabr. It is greyish silvery blue, much like *C. lithargyria*, Moore, but darker; and I should much prefer to say that it was the same as the latter species than the former.

We have specimens of *C. strabo* from N. Australia, whence the type of *C. platissa* is stated to have come. The male is described as pale sky-blue, and it is impossible to recognize the species from the figures given of the female.

Tarucus, Moore.

Tarucus plinius.

Tarucus plinius, Fabr. Ent. Syst. vol. iii. pt. 1, p. 284 (1793).
Lampides cassioides, Murray, Ent. Mo. Mag. x. p. 108 (1873).
Lampides pseudocassius, Murray, Ent. Mo. Mag. x. p. 126 (1873).

Malaita I. Florida I. Fauro I.

A large race of this variable insect seems to inhabit these islands, and the only female before me (from Malaita I.) is much clouded with brown and has very little blue on the disks. Some confusion still seems to exist as to this species and its allies: Mr. Trimen (South-African Butt. vol. ii. p. 69, 1887) places *T. pulchra*, Murray, as a synonym of *T. telicanus*, Lang, whilst Mr. de Nicéville (Butt. Ind., &c. vol. iii. p. 194, 1890) places it under *T. plinius*, and states (p. 187) that *T. telicanus*, Lang, is another species, which I think will probably prove to be the case.

There is very little doubt that Mr. Murray has described another variety of this species.

ARHOPALA, Boisd.

ARHOPALA SOPHAX.

Amblypodia sophax, Mathew, Trans. Ent. Soc. 1887, p. 47.

Alu I., near Shortland I. Fauro I. Rubiana I. Aola, Guadalcanar I. Ugi I. (*Mathew*).

Closely allied to *A. phryxus*, Boisd., and *A. helius*, Cr., from which it seems to differ on the underside in having the ultra-median macular band on the fore wing more regular and the spots also generally larger.

The type specimens are in Messrs. Godman and Salvin's collection.

ARHOPALA SOPHROSYNE. (Plate XXXII. fig. 9, ♂.)

Amblypodia sophrosyne, Smith, Ent. Mo. Mag. xxv. p. 300 (1889).

Aola, Guadalcanar I.

A fine and distinct species, not closely allied to any with which I am acquainted, but, as stated by Mr. H. G. Smith, nearest to *A. æxone*, Hew.

ARHOPALA EURISUS, sp. n. (Plate XXXII. figs. 11 ♂, 12 ♀.)

Male. Upperside dark purple, slightly bluish at the base; costa and outer margin of fore wing and outer margin of hind wing very narrowly black; costa of hind wing rather broadly black; anal fold brownish black. Underside brown, with the spots and markings darker than the ground-colour and bordered with whitish brown, with the exception of the two in the cell and the one at the end of the cell of fore wing, which are bordered with silvery blue. The markings are arranged much as in *A. adorea*, de Nicév., but in the fore wing the outer band, the spot on the costa, and the lower spot of the ultra-median band are wanting, and on the hind wing the submarginal line and the band within are absent.

Female. Light cobalt-blue, lighter at bases and shading off to purple at its outer margin on the hind wing. Fore wing: apex and outer margin rather broadly black; costal margin light brown at the base, merging into black about opposite the middle of the cell. Hind wing: costal and outer margins rather narrowly, and apex rather broadly, black.

Head, thorax, and abdomen concolorous with wings. Tail black, tipped with white.

Expanse, ♂ 2 inches, ♀ $1\frac{3}{5}$–2 inches.

Fauro I. Aola, Guadalcanar I. Florida I.

In form and general appearance this insect resembles Mr. de Nicéville's figure of *A. adorea* (Butt. Ind., Burmah, & Ceyl. vol. iii. frontis. fig. 139, 1890), but is rather smaller. It is also allied to *A. micale*, Blanch., and is somewhat like Hewitson's figure no. 29 of *A. adatka*.

There is a specimen (♂) in Messrs. Godman and Salvin's collection which is much like *A. eurisus* on the underside, but on the upperside is of a darker purple and all the margins appear broadly black. It is from Malaita I., but unfortunately so much broken that I do not think it advisable to name it. A male and female from Aola are figured.

DEUDORYX, Hew.

DEUDORYX WOODFORDI, sp. n. (Plate XXXII. figs. 13 ♂ 14 ♀.)

Allied to *D. diovis*, Hew.

Male. Differs in its larger size, and being rich cupreous in place of dark orange on upperside, and on the underside by being dark greyish brown, by the ultra-median band on fore wing being placed at a greater angle to the outer margin, and by the marginal spot on the hind wing between the lower median nervules being larger and bordered inwardly with orange, not encircled as in *D. diovis*. The front of the head, which in *D. diovis* is bright yellow, white.

Female. Upperside: dull greenish black (not brown as in *D. epijarbas*, Moore), darker in the cell and along costal margin of fore wing. Lobe dark orange, with a black spot on its outer extremity. Underside as in male, but paler.

Head and thorax of male black; anal half of abdomen cupreous as wings; basal half black. Head, thorax, and abdomen of female concolorous with wings.

Tail black, tipped with white.

Expanse, $1\frac{9}{10}$ (♂) to $1\frac{7}{10}$ inch (♀).

Aola, Guadalcanar I.

Mr. Woodford's collection contained a number of specimens of this species which do not show any variation.

DEUDORYX VIRIDENS, sp. n. (Plate XXXII. fig. 15.)

Male. Upperside intermediate in colour between *D. diovis* and *D. woodfordi*. Underside pale as in *D. diovis*, but strongly dusted over both wings with light green scales. The spot at the end of the cell large and distinct and much darker than any other marking on either wing, and the band beyond bent in its middle towards the outer margin. The black spot near the margin between the lower median nervules on hind wing smaller than in *D. woodfordi* and bordered inwardly with silvery blue, outwardly with faint orange.

Head, thorax, and abdomen blackish brown.

Expanse $1\frac{3}{5}$ inch.

Aola, Guadalcanar I.

This insect can be readily distinguished from its allies by the green appearance of the underside.

The black spot in the lobe in this species and in *D. woodfordi* is always on the lower edge, in *D. epijarbas* and *D. diovis* it is always in the centre.

I have not seen the female.

BINDAHARA, Moore.

BINDAHARA ISABELLA.

Myrina isabella, Feld. Sitz. Ak. Wiss. Wien, math.-nat. Cl. xl. p. 451. n. 10 (1860).

♀. *Myrina jolcus*, Feld. l. c. n. 11 (1860); Hew. Ill. D. L. t. 13. figs. 16, 17 (1863).

Sithon chromis, Mathew, Trans. Ent. Soc. 1887, p. 47.

Alu I., near Shortland I. Fauro I. Aola, Guadalcanar I. N.W. Bay, Malaita I. Ugi I. (*Mathew*).

I can find no points whereby to distinguish Mr. Mathew's species from *B. isabella*, which has been lately figured by Dr. Staudinger (Exot. Schmett. pl. 95). Mr. Mathew states (Trans. Ent. Soc.) that *S. chromis* is "allied to *S. phocides* (Feld.!), but differs . . . . in possessing . . . . a deep purple blotch near apex, instead of a short, narrow, blue band." The *H. phocides*, Fabr., is now known to be a species without any blue whatever on the upperside.

Mr. Woodford obtained a large number of males of this species varying very much in size, also several females which agree well with Hewitson's figure.

There is a specimen in the British Museum from the Aru Islands.

THECLA (?) ALCESTIS.

Thecla alcestis, Smith, Ent. Mo. Mag. xxv. p. 300 (1889).

Gela I.

I have not seen specimens of this species and am unable to determine to which genus it is rightly referable.

DESCRIPTION OF THE PLATES.

PLATE XXXI.

Fig. 1. *Pithecops dionisius*, p. 358.
2. —— ——, var. *steirema*, p. 358.
3. *Nacaduba plumbata*, ♂, p. 359.
4. —— ——, ♀, p. 359.
5. —— *ugiensis*, ♀, p. 360.
6. —— *euretes*, ♂, p. 360.
7. —— ——, ♀, p. 360.
8. —— *korene*, ♂, p. 361.
9. —— *maniana*, ♂, p. 361.
10. —— *amaura*, ♂, p. 361.
11. —— *ligamenta*, ♂, p. 361.
12. —— ——, ♀, p. 361.
13. —— *keiria*, ♂, p. 362.
14. —— ——, ♀, p. 362.
15. *Prosotas caliginosa*, ♂, p. 366.
16. *Thysonotis kruera*, ♂, p. 364.
17. —— ——, ♀, p. 364.
18. *Nacaduba vincula*, ♂, p. 363.
19. *Jamides cephion*, ♂, p. 367.
20. —— *amarauge*, ♂, p. 366.
21. —— ——, ♀, p. 366.

PLATE XXXII.

Fig. 1. *Thysonotis cepheis*, ♂, p. 364.
2. —— ——, ♀, p. 364.
3. —— *chromia*, p. 365.
4. *Jamides sœmias*, ♂, p. 367.
5. —— ——, ♀, p. 367.
6. *Epimastidia arienis*, p. 365.
7. *Lampides areas*, ♂, p. 368.
8. —— ——, ♀, p. 368.
9. *Arhopala sophrosyne*, p. 370.
10. *Nacaduba astarte*, p. 359.
11. *Arhopala eurisus*, ♂, p. 370.
12. —— ——, ♀, p. 370.
13. *Deudorix woodfordi*, ♂, p. 371.
14. —— ——, ♀, p. 371.
15. —— *viridens*, ♂, p. 371.

June 16, 1891.

Dr. St. George Mivart, F.R.S., Vice-President, in the Chair.

Mr. H. A. Bryden exhibited, and made remarks upon, a distorted pair of Horns of a cow Eland (*Oreas canna*) shot by him in 1890, in the North Kalahari. Mr. Bryden also exhibited specimens of the feet of the Lechée Antelope (*Cobus lechée*) and remarked upon their peculiar conformation.

Mr. Howard Saunders, F.Z.S., exhibited and made remarks on a nearly white skin of a Tiger from Northern India. The animal had been sent for preservation to Messrs. Keilich and Son by Major D. Robinson, Lancashire Fusiliers, Poona. From the skull and the condition of the teeth it appeared to be an adult male in the prime of life, the incisors being sharp and perfect.

Col. H. H. Godwin-Austen, F.Z.S., remarked that in his long experience in India he had only met with one similar example.

Mr. Howard Saunders also exhibited and made remarks on some specimens of the eggs of the Spot-winged Gull (*Larus maculipennis*) and Trudeau's Tern (*Sterna trudeaui*), from the province of Buenos Ayres, obtained by Mr. Ernest Gibson, F.Z.S., and believed to be exhibited for the first time. The eggs of the former bird were, as might be expected, similar in character to those of other marsh-breeding brown-capped Gulls. The eggs of *Sterna trudeaui* were intermediate in their shape and pattern between those of the coast-breeding Terns (*Sterna*) and those of the marsh Terns (*Hydrochelidon*). The nests of this Tern were stated to be placed in the swamps, amongst those of the Gull above mentioned.

Mr. Sclater read an extract from a letter addressed to him by Dr. H. Bolau, C.M.Z.S., Director of the Zoological Garden, Hamburg, and dated Hamburg, June 8th. In reply to inquiries Dr. Bolau stated that there were now two examples of Sea-Eagles referred to *Haliaëtus pelagicus* living in the Hamburg Garden. One of these, received as a present from a ship-captain, December 12th, 1882, had been brought from Amoor-land; the second, received on February 6th, 1887, had been presented by another captain, who had obtained it in Corea. The first-named bird was in full plumage and had a large white shoulder-spot, a white tail, and white thighs, as represented by Pallas ('Zoographia,' i. p. 343). But the specimen from Corea, although now more than four years in the Garden, had not changed in colour. Its tail was white, but the shoulders and thighs showed no traces of this colour, being of a brownish black like the rest of the body. This bird was also larger than that from Amoor-land and had a stronger bill. Dr. Bolau suggested that the Corean bird might be a large female of *H. pelagicus*, which had not obtained the adult coloration on account of its being kept in captivity; but Mr. Sclater pointed out that it was undoubtedly the same bird as had been described by Taczanowski in his article on the birds of Corea (P. Z. S. 1888, p. 452) as *Haliaëtus branickii*, and was a specimen of very great interest, as tending to confirm this somewhat problematical species.

The only previously known example of *H. branickii*, upon which the species had been based, had been obtained by the Polish collector Kalinowski at Tsempion, on the coast of Corea, in February 1888. But Kalinowski had stated that he had seen other similar birds in the same country.

Dr. R. Bowdler Sharpe, F.Z.S., gave a verbal account of the proceedings of the recent International Ornithological Congress at Budapest in which he had taken part.

The following papers were read:—

1. A Contribution to the Knowledge of the Races of *Rana esculenta* and their Geographical Distribution. By G. A. Boulenger.

[Received May 26, 1891.]

It is now a well-known fact that the Edible Frog, *Rana esculenta*, L.[1], presents a greater amount of variation, both as regards structure and colour, than perhaps any other species of Batrachians. Any herpetologist having before him the Japanese and Spanish Frogs, without

[1] I wish to remark on this occasion that the current notion that the flesh of this Frog is more valued than that of its European congeners is entirely erroneous. The Frogs sold in the markets of Paris, Brussels, and Geneva are almost invariably *Rana temporaria*, which are commoner and more easily caught.

any knowledge of the intermediate forms, would unhesitatingly pronounce them as representing distinct species: they have, in fact, been referred to distinct genera by such experienced workers as Peters and Cope. But if we pursue our investigations over the wide area occupied by this Frog, viz. the whole of the Palæarctic Region, we soon find all the differences by which we were at first struck to blend through such a number of intermediate forms as to leave no other course open but to maintain intact the Linnean species. However, a great difficulty still remains to be dealt with: the principal of the differences ascertained are not merely individual; nor are they entirely dependent on locality or climate, as almost identical specimens are met with at such distant points as North Germany, the Sahara, and Baluchistan. And, what is more striking still, in the case of two forms occurring in the same country, they may be perfectly separable and not interbreed, as has been shown to be the case in Germany. It is therefore not serving the interest of exact taxonomy and zoogeography to be satisfied with the comprehensive notion of *Rana esculenta*. Attempts should be, and have been, made at a division of the specific type into races or subspecies. With this object in view, I have, for the last few years, been amassing material and information, and have subjected the many hundreds of specimens which have passed through my hands to a most minute examination and comparison.

Although I have, unfortunately, failed in my attempt at drawing very sharp demarcation lines between the various forms, I am still in hopes that others may be more successful; and with the object of furnishing them with a basis for future researches, I venture to publish the following notes, which at the same time show the extent of the material upon which I have worked.

The first attempt at subdividing *Rana esculenta* into subspecies, published by Camerano in 1881 [1], proved on the whole a failure. The two groups into which the species was divided are quite arbitrary; the author's typical form appears to include part of *R. ridibunda*, and his var. *lessonæ* evidently embraces specimens of the typical form. In various papers [2] I have endeavoured to throw some light on the matter, and my contributions have been supplemented by Bœttger and Wolterstorff. The latest work on the subject is from the pen of J. de Bedriaga [3], who admits four forms in Europe and Western Asia, or one more than I am able to recognize, the Spanish-North-African specimens being regarded by him as forming a subspecies distinct from *R. ridibunda* = *fortis*.

I now propose to divide *Rana esculenta* into four principal forms, viz.:—

1. Var. RIDIBUNDA.

= *R. ridibunda*, Pall., *R. cachinnans*, Pall., *R. caucasica*, Pall.,

[1] C. R. Assoc. Franç., Congrès d'Oran, p. 680. Also Mon. Anf. An. Ital. p. 61 (1883).

[2] Zoologist, 1884, pp. 220, 265; Proc. Zool. Soc. 1884, p. 573, pl. lv., and 1885, p. 666, pl. xl.

[3] Bull. Soc. Mosc. 1889, p. 242.

R. tigrina, Eichw., *R. dentex*, Kryn., ?*R. maritima*, Risso, *R. hispanica*, Mich., vars. *latastii, bedriagæ*, Cam., *R. fortis*, Boul., var. *perezi*, Seoane.

This is the largest and most widely distributed form, inhabiting the whole of Europe with the exception of the North-western and Central parts and Italy, Western Asia as far east as North Baluchistan, Afghanistan, and Eastern Turkestan, and North Africa. As being on the whole the least specialized form, *i. e.* departing less from the normal pattern of the genus to which it belongs, it deserves to rank first in the list, although the denomination of *forma typica* pertains to the next form, as having been first described under the name of *R. esculenta*.

2. Forma TYPICA.

=*R. esculenta*, L., *R. viridis aquatica*, Rös., var. *silvatica*, Koch (type examined).

Northern and Central Europe, Italy, Russia.

3. Var. LESSONÆ.

=var. *lessonæ*, part., Cam.

The habitat of this Frog, which in its characters is intermediate between the preceding and the next, is still very incompletely ascertained, specimens being known from England (Cambridgeshire and Norfolk), the Rhine, the province Saxony, Piedmont and probably other parts of Italy, and Malta. The British specimens are most likely introduced from Italy. The opinion recently expressed by Bedriaga, that Bell's *R. scotica* may belong to this form, is due to his having misunderstood that author. The figure given in the first edition of the 'British Reptiles,' and which has been reproduced in the second edition and copied by Ecker (Anat. des Frosches), is "taken from a foreign specimen," and represents *R. esculenta typica*. Bell's *R. scotica* is a synonym of *R. temporaria*.

4. Var. NIGROMACULATA.

=*R. marmorata*, Hallow.; *R. nigromaculata*, Hallow.; *Hoplobatrachus reinhardti*, Peters; *Tomopterna porosa*, Cope; var. *japonica*, Boul.

The name *japonica* should be reserved for a species of the *temporaria*-group; and *R. esculenta*, var. *marmorata*, Massal., is of earlier date than *R. marmorata*, Hallow. I therefore adopt the name *nigromaculata*, Hallow., which stands next on the list of synonyms. This Eastern form ranges from Corea and Japan to Southern China and Siam; the exact western limits of its habitat have still to be ascertained, and it would be particularly desirable to know whether it anywhere comes into contact with or overlaps the area of the *ridibunda* form.

The principal characters which have proved of service in diagnosing these forms are the following:—

1. The development of the inner metatarsal tubercle, whether

large or small, blunt or compressed. The length indicated in the measurements below is the basal, *i. e.* taken along the *attachment* of the tubercle to the foot; the length of the first toe, given for comparison, is taken from the tubercle; and the length of the tubercle is also compared to the length of the crus or tibia measured in the flesh.

2. The comparative length of the tibia to the thigh; this is shown by pressing the two close together and maintaining the tibia at right angles to the axis of the body; the tibial extremity is then found to overlap, to meet or to fail to meet its fellow placed in the same position. Only in form 1 do they overlap [1], and this character alone differentiates it from the three others.

3. The presence or absence of short glandular folds along the back, in addition to the glandular dorso-lateral fold. The presence of these folds differentiates form 4 from the three others.

4. The presence or absence of bright yellow pigment on the lumbar and post-femoral regions. This pigment is constantly absent in form 1, and very seldom in form 2. The character unfortunately cannot be made use of with spirit-specimens.

By means of these characters we are able to draw up the following key, which is imperfect only in so far that forms 2 and 3 are not distinguished from each other in an absolute manner; this difficulty, however, cannot be overcome, as the two forms do run completely into one another, and future investigations may even render their separation unadvisable.

			Met. tubercle times in length of inner toe.	in length of tibia.
No dorsal folds.	Heels overlapping.	1. *ridibunda.*	Met. tubercle $2\frac{1}{2}$–4	$9\frac{1}{2}$–14
	Heels not overlapping	2. *typica.*	„ 2–3	7–10
		3. *lessonæ.*	„ $1\frac{1}{3}$–2	5–8
Dorsal folds	....	4. *nigromaculata.*	„ 1–$1\frac{2}{3}$	5–8

Other characters have been added to complete the definitions.

In the following tables a complete list of the specimens in the British Museum is given, together with measurements taken from individuals from various localities. In these measurements the figures in column **1** give the length, in millimetres, from snout to vent; in column **2**, the length of the tibia; in column **3**, the length of the foot measured from the outer metatarsal tubercle to the end of the fourth toe; in column **4**, the length of the inner toe; and in column **5**, the length of the inner metatarsal tubercle.

The specimens enumerated are but a portion of the material studied, a picked series, in which consequently abnormal specimens, *i. e.* such as fit least well in the technical definitions, are in greater proportion than in collections made without discrimination. The number of specimens in the Museum is also greater than appears from the figures, as I have abstained from counting in any case

[1] As in the various species of the *temporaria*-group, all of which, however long or short the hind limbs, possess this character.

more than 10 specimens in each bottle ; and the skeletons are not enumerated.

1. Var. RIDIBUNDA.

Inner metatarsal tubercle small, blunt, feebly prominent, its length $2\frac{1}{2}$ to 4 times in the length of the inner toe measured from the tubercle, and $9\frac{1}{2}$ to 14 times in the length of the tibia (in the flesh); when the limbs are folded at right angles to the body, the extremities of the tibiæ overlap ; tibia as long as or slightly shorter than the foot measured from the outer metatarsal tubercle. Skin smooth or more or less warty ; glandular lateral fold more or less prominent, frequently as broad as the upper eyelid. Olive, dull green, or bronzy brown above, rarely bright green, spotted or speckled with dark olive or blackish ; the spots never forming longitudinal bands ; no bright yellow pigment on the back of the thighs ; vocal sacs grey.

Measurements.

		1.	2.	3.	4.	5.
♂.	Gironde........	65	34	34	10	3
♂.	,, ...	50	27	29	$7\frac{1}{2}$	2
♀.	,, ...	85	44	44	13	4
♀.	,, ...	61	32	32	9	$2\frac{1}{2}$
♂.	Corunna	60	28	30	8	3
♀.	,, ...	74	33	33	9	3
♂.	Serra de Gerez ..	62	34	35	10	3
♀.	,, ..	71	38	38	11	3
♂.	Oporto	58	30	30	9	3
♀.	,, ...	81	43	42	12	$3\frac{1}{2}$
♂.	Cintra	60	31	31	9	$2\frac{1}{2}$
♀.	,, ...	72	37	36	9	3
♂.	Alemtejo	57	32	32	$8\frac{1}{2}$	$3\frac{1}{2}$
♀.	,, ...	85	47	44	12	$4\frac{1}{2}$
♂.	Berlin	88	42	44	12	4
♂.	,, ...	76	37	40	10	3
♀.	,, ...	104	50	51	15	$4\frac{1}{2}$
♀.	,, ...	72	36	37	10	$2\frac{1}{2}$
♂.	Halle	83	41	42	$11\frac{1}{2}$	4
♀.	,, ...	98	49	51	14	5
♂.	Warsaw........	70	38	40	$10\frac{1}{2}$	3
♀.	,, ...	94	47	47	$13\frac{1}{2}$	4
♂.	Prague	85	45	45	$11\frac{1}{2}$	4
♀.	,, ...	87	42	42	12	4
♂.	Vienna	92	48	48	13	$4\frac{1}{2}$
♀.	,, ...	90	48	48	14	4
♂.	Constantinople ..	62	34	34	10	3
♀.	,, ..	70	38	37	11	$3\frac{1}{2}$
♂.	Astrachan......	95	47	50	13	5
♀.	,, ...	92	49	49	13	4

Measurements (continued).

		1.	2.	3.	4.	5.
♀.	Kirghiz	87	47	47	14	4
♂.	Ielenowka	90	46	46	14	4
♀.	,, ...	93	50	50	15	5
♀.	Tschinas	80	37	38	12	4
♀.	Sarawan	90	44	44	13	4
♂.	Shiraz	48	28	30	8	3
♂.	Fao	73	36	36	10	$3\frac{1}{2}$
♀.	Elizabethpol	100	50	50	15	5
♂.	Smyrna	64	33	32	9	$2\frac{1}{2}$
♀.	,, ...	87	43	42	13	4
♀.	Cyprus	73	37	36	11	$3\frac{1}{2}$
♀.	Dead Sea	90	45	43	13	$4\frac{1}{2}$
♀.	Sinaitic Peninsula	67	32	32	10	4
♀.	Tunis	75	37	38	11	$3\frac{1}{2}$
♀.	Constantine ...	90	44	46	13	4
♂.	Hammam Rirha .	65	33	33	10	$3\frac{1}{2}$
♀.	Biskra	96	45	45	13	4
♀.	Tangier	85	45	45	13	4
♀.	,, ...	65	35	34	10	3

List of the Specimens.

Europe.

1–10. ♂, ♀, hgr., & yg.	Cadillac, Gironde.	M. F. Lataste [P.].
11–14. ♂ ♀.	Corunna.	M. V. L. Seoane [P.].
15–19. ♂, ♀, & hgr.	Serra de Gerez.	Dr. H. Gadow [C.].
20–21. ♂ ♀.	Upper Douro, Tras os Montes.	Dr. H. Gadow [C.].
22–25. ♂ ♀.	Oporto.	Dr. H. Gadow [C.].
26–28. ♂ ♀.	Serra Estrella.	Dr. H. Gadow [C.].
29–37. ♂, ♀, hgr., & yg.	Alemtejo.	Dr. H. Gadow [C.].
38–41. ♂, ♀, & hgr.	Cintra.	Dr. H. Gadow [C.].
42–45. Hgr. & yg.	Algarve.	Dr. H. Gadow [C.].
46. ♂.	Seville.	M. V. L. Seoane [P.].
47. ♂.	S. Spain.	M. F. Lataste [P.].
48–57, 58–67. ♂, ♀, hgr., & yg.	Berlin.	G. A. Boulenger, Esq. [P.].
68–73. ♂ ♀.	Salziger See, near Halle/S.	Dr. W. Wolterstorff [P.].
74–76. Yg.	Magdeburg.	Dr. W. Wolterstorff [P.].
77–80. ♂ ♀.	Warsaw.	Prof. Wrzeniowski [P.].
81–86. ♂ ♀.	Prague.	Hr. V. Fritsch [C.].
87–90. ♂ ♀.	Laaerberg, near Vienna.	Dr. F. Werner [P.].
91. ♀.	Hungary.	Lord A. Russell [P.]
92. ♀.	Hungary.	
93. ♀.	Crete.	
94–103. ♂, ♀, hgr., & yg.	European shore of the Bosphorus.	Dr. Dickson [P.].
104–105. ♂ ♀.	Astrachan.	St. Petersburg Mus. [P.].

Asia.

106. ♀.	Kirghiz Steppes.	Moscow University [E.].
107–110. ♀ & yg.	Tschinas, Turkestan.	St. Petersburg Mus. [E.].
111–114. ♂ ♀.	Ielenowka, Lake Goktsha.	St. Petersburg Mus. [E.].
115–116. Yg.	Nukus, Amu Daria.	St. Petersburg Mus. [E.].
117–123. ♂, ♀, & yg.	Guermab, S.W. of Ashkabad.	Warsaw Mus. [E.].
124–125. ♂ & hgr.	Turbat, Afghanistan.	Dr. Aitchison [C.].
126. Larva.	Between Quetta and Nushki.	Dr. Aitchison [C.].
127–128. ♂ ♀.	Near Sarawan, Baluchistan.	G. E. Mason, Esq. [P.].
129. Hgr.	Bussorah.	W. T. Blanford, Esq. [C.].
130. ♀.	Shiraz.	W. T. Blanford, Esq. [C.].
131. ♂.	Fao, head of Persian Gulf.	D. Cumming, Esq. [P.].
132. ♀.	Mesopotamia.	Euphrates Expedition.
133. Yg.	Guezama.	W. C. Trevelyan, Esq. [P.].
134–135. ♂ ♀.	Dagestan, Caucasus.	Moscow University [E.].
136–138. ♂ ♀.	Elizabethpol.	St. Petersburg Mus. [E.].
139. ♀.	Lenkoran.	St. Petersburg Mus. [E.].
140–141. ♀.	Suchum Kalé, Transcaucasia.	St. Petersburg Mus. [E.].
142–145. Yg.	Lake Abran, near Suchum Kalé.	St. Petersburg Mus. [E.].
146. Yg.	Albistan.	C. G. Danford, Esq. [P.].
147–152. ♂ ♀.	Fener-bahtchi, Asiatic shore of the Sea of Marmora.	Dr. Dickson [P.].
153–154. ♂ ♀.	Smyrna.	
155. ♀.	Cyprus.	Lord Lilford [P.].
156. ♀.	Sea of Galilee.	Canon Tristram [C.].
157–158. ♂.	Plains of Phœnicia.	Canon Tristram [C.].
159. ♀.	Merom.	Canon Tristram [C.].
160–161. ♂ ♀.	Dead Sea.	Canon Tristram [C.].
162. ♂.	Jericho.	Dr. J. Anderson [P.].
163. ♀.	Damascus.	Dr. J. Anderson [P.].
164–165. ♀ & hgr.	Sinaitic Peninsula.	H. C. Hart, Esq. [P.].

Africa.

166–167. ♀.	Tunis.	Mr. Fraser [C.].
168. Yg.	Susa, Tunisia.	Mr. Fraser [C.].
169–178. ♂, ♀, & yg.	Constantine.	P. L. Sclater, Esq. [P.].
179–182. ♂ & yg.	Hamman Rirha, Algeria.	Dr. J. Anderson [P.].
183–185. ♀.	Biskra.	Dr. J. Anderson [P.].
186–189. Larvæ.	Algeria.	M. Héron Royer [E.].
190–194. ♀.	Tangier.	M. H. Vaucher [C.].
195–196. Yg.	Casablanca, Morocco.	Senckenberg Mus. [E.].
197–203. ♂ ♀.	Madeira.	Prof. Lütken [P.].
204–207. ♂, ♀, & yg.	Azores (introduced).	F. D. Godman, Esq. [P.].

2. Forma TYPICA.

Inner metatarsal tubercle strong, compressed, prominent, its length 2 to 3 times in the length of the inner toe measured from the tubercle, and 7 to 10 times in the length of the tibia; when the limbs are folded at right angles to the body, the extremities of the tibiæ meet or remain narrowly separated; tibia shorter than the foot measured from the outer metatarsal tubercle. Skin smooth or with small warts; glandular lateral fold very prominent, as broad as or narrower than the upper eyelid. Bright green, brown, or blue above, uniform or spotted with black; hinder side of thighs handsomely marbled with black, and usually with more or less of bright yellow pigment; vocal sacs white or feebly pigmented.

The range of variation of the somewhat complex assemblage which I have endeavoured to define as the *typical form* is very great indeed and forms a gradated series leading from the form *ridibunda* to the form *lessonæ*.

I must confess that the line drawn between the latter and the typical form appears to me arbitrary, and that my arrangement is open to this criticism, that there is altogether a greater amount of difference between the two extremes of the series than there is between the extreme in the *lessonæ* direction and the form *lessonæ* itself. The true typical *R. esculenta*, as figured by Rösel, is pretty well in the middle of the series: the extreme specimens with small inner metatarsal tubercle are from France, Corsica, and Italy; whilst the opposite extreme obtains in the specimens from Basle and Vienna.

Measurements.

		1.	2.	3.	4.	5.
♂.	St. Malo	73	33	35	8½	3½
♀.	„	72	34	38	10	4
♂.	Paris	69	35	38	9	4
♀.	„	84	38	40	10	4
♂.	Brussels........	54	28	32	8	3½
♀.	„	66	33	37	10	4
♂.	Basle..........	61	27	31	7	3½
♂.	„	56	26	31	7	3½
♀.	„	67	31	35	8	4
♀.	„	63	29	32	8	4
♂.	Geneva	61	31	34	8½	3½
♂.	„	51	25	28	6	3
♀.	„	78	39	40	10	4½
♀.	„	70	36	37	9½	4
♂.	Copenhagen	68	30	35	8½	4
♂.	„	63	28	32	7	3½
♀.	Lolland........	85	35	38	9	5
♀.	„	80	36	43	10	4½
♂.	Berlin	68	32	37	9	4
♀.	„	86	35	39	10	5
♀.	Warsaw........	87	42	46	11½	5½
♀.	„	80	37	40	10	5
♀.	Neusiedl Lake ..	81	43	46	13	5
♀.	„ ..	80	40	45	13	5
♂.	Vienna	64	30	33	8	4
♀.	„	50	24	26	7	3½
♂.	Nice	54	27	30	7½	3
♀.	„	80	41	43	12	4
♂.	Rivoli	65	32	35	9	4
♀.	„	66	32	35	9	4

Measurements (continued).

		1.	2.	3.	4.	5.
♀.	Verona	81	41	43	12	5
♂.	Florence	73	36	37	10	$3\frac{1}{2}$
♀.	,, ...	65	31	33	9	3
♀.	Pisa	80	35	37	$9\frac{1}{2}$	$4\frac{1}{2}$
♂.	Naples	65	34	36	9	$3\frac{1}{2}$
♀.	,, ...	60	28	31	8	$3\frac{1}{2}$
♂.	Corsica	65	32	35	$9\frac{1}{2}$	$3\frac{1}{2}$
♀.	,, ...	77	36	38	10	4

List of the Specimens.

1, 2. ♂.	Foulden, Norfolk (introduced).	W. Amhurst Amherst, Esq. [P.].
3–10. ♂, ♀, hgr., & larva.	Near St. Malo.	G. A. Boulenger, Esq. [P.].
11–12. ♂ ♀.	Paris.	G. A. Boulenger, Esq. [P.].
13–14. ♂ ♀.	Argenton, Indre.	M. R. Parâtre [E.].
15–24. ♂, ♀, & yg.	Heyst s. M., Belgium.	G. A. Boulenger, Esq. [P.].
25–31. ♂, ♀, hgr., & yg.	Brussels.	G. A. Boulenger, Esq. [P.].
32–34. Hgr.	Mondorf, Luxemburg.	G. A. Boulenger, Esq. [P.].
35–42. ♂ ♀.	Basle.	Dr. F. Müller [P.].
43–47. ♂ ♀.	Zofingen, Aargau.	Dr. F. Müller [P.].
48–52. ♂ ♀.	Mt. Saleve, Geneva.	Dr. F. Müller [P.].
53. ♀.	Starnberger See, Munich.	Dr. W. Wolterstorff [P.].
54. Yg.	Hanover.	Dr. J. E. Gray [P.].
55–61, 62–65, 66–70, 71–73. ♂, ♀, hgr., & yg.	Berlin.	G. A. Boulenger, Esq. [P.].
74–78. ♂ ♀.	Copenhagen.	Prof. C. F. Lütken [P.].
79–83. ♂ ♀.	Lolland.	Prof. C. F. Lütken [P.].
84–89. ♂ ♀.	Warsaw.	Prof. Wrzeniowski [P.].
90–91. Hgr.	Moscow.	Moscow University [E.].
92–93. ♂ ♀.	Neusiedl Lake, Hungary.	Dr. F. Werner [E.].
94–96. ♂ ♀.	Prater, Vienna.	Dr. F. Werner [E.].
97–98. ♀ & yg.	Nice.	Dr. J. de Bedriaga [P.].
99–100. ♂ ♀.	Mouth of R. Var.	Dr. J. de Bedriaga [P.].
101. ♀.	Verona.	M. E. de Betta [P.].
102–107. ♂, ♀, & yg.	Rivoli, Prov. Verona.	M. E. de Betta [P.].
108–110. ♂ ♀.	Calcinaro, Prov. Verona.	M. E. de Betta [P.].
111–113. ♀.	Mestre, Prov. Venice.	M. E. de Betta [P.].
114–115, 116–117, 118–119. ♂, ♀, yg., & larvæ.	Bologna.	Prof. J. J. Bianconi [P.].
120–126. ♂, ♀, hgr., & yg.	Florence.	Florence Museum [E.].
127–128. ♂ ♀.	Pisa.	Florence Museum [E.].
129–132. ♂ ♀.	Naples.	Dr. F. S. Monticelli [P.].
133–135. ♂ ♀.	Corsica.	Dr. J. de Bedriaga [P.].
136. ♀.	Corsica.	M. A. Dollfus [P].
137. ♂.	Corte, Corsica.	Florence Museum [E.].

3. Var. LESSONÆ.

Inner metatarsal tubercle very strong, compressed, hard, crescentic, its depth about half its length, which is $1\frac{1}{2}$ to 2 times in the length of the inner toe, and 5 to 8 times in the length of the tibia; when the limbs are folded at right angles to the body, the extremities of the tibiæ sometimes meet, but usually fail to meet; tibia considerably shorter than the foot measured from the outer metatarsal tubercle. Skin smooth or with small warts; glandular lateral fold very prominent, narrower than the upper eyelid. Bright green or brown above, the dark markings sometimes forming longitudinal bands; hinder side of thighs handsomely marbled with black on a bright yellow or orange ground; vocal sacs not or but very slightly pigmented.

Measurements.

		1.	2.	3.	4.	5.
♂.	Foulmire	51	23	28	6	3½
♀.	"	67	28	33	7½	4½
♂.	Stow Bedon	64	25	34	7½	5
♀.	"	78	30	39	9	6
♂.	Hilden	49	23	28	5½	3½
♀.	"	58	25	30	6½	4
♂.	Offenbach	53	24	28	6	3½
♀.	"	55	24	28	6½	3
♀.	Cröllwitz	55	24	28	7	4
♂.	Piedmont	48	23	27	6	3½
♀.	"	73	31	37	8	5
♀.	"	68	31	34	8	4
♀.	"	54	25	29	6	3½
♀.	Malta	70	32	36	9½	5½

List of the Specimens.

1–3, 4–6. ♂, ♀, hgr., & yg.	Foulmire Fen, Cambridgeshire.	W. Yarrell, Esq. [P.].
7–12, 13. ♂, ♀, hgr., & yg.	Stow Bedon, Norfolk.	Lord Walsingham [P.].
14–18. Yg.	Stow Bedon.	G. E. Mason, Esq. [P.].
19–22. ♂ ♀.	Hilden, near Düsseldorf.	W. F. Kirby, Esq. [P.].
23–26. ♂, ♀, & hgr.	Offenbach.	Dr. J. de Bedriaga [P.].
27. ♀.	Cröllwitz, near Halle.	Dr. W. Wolterstorff [P.].
28–37. ♂, ♀, hgr., & yg.	Piedmont.	Prof. L. Camerano [P.].
38. ♀.	Malta.	Zoological Society [P.].

4. Var. NIGROMACULATA.

Inner metatarsal tubercle very strong, compressed, hard, crescentic, its depth about half its length, which is 1 to $1\frac{2}{3}$ times in the length of the inner toe, and 5 to 8 times in the length of the tibia; when the limbs are folded at right angles to the body, the extremities of the tibiæ meet; tibia considerably shorter than the foot measured from the outer metatarsal tubercle. Interrupted narrow glandular folds along the back, in addition to the dorso-lateral, which are well-marked and narrower than the upper eyelid. Green or brown above, the black markings often forming longitudinal bands; hinder side of thighs handsomely marbled with black on a yellow ground; sometimes a light line running along the inner upper side of the tibia; vocal sacs more or less pigmented.

Measurements.

		1.	2.	3.	4.	5.
♀.	Gensan	85	38	44	9	$5\frac{1}{2}$
♂.	Japan	70	35	40	8	5
♂.	"	65	35	39	8	5
♀.	"	80	40	46	10	6
♀.	"	75	38	42	9	$5\frac{1}{2}$
♂.	Central Japan ..	54	23	28	6	$3\frac{1}{2}$
♀.	" ..	52	21	25	6	$3\frac{1}{2}$
♂.	Loo Choo	63	32	37	$7\frac{1}{2}$	6
♂.	Chefoo	58	27	31	$5\frac{1}{2}$	$5\frac{1}{2}$
♀.	"	65	31	36	7	6
♀.	Shanghai	66	33	38	8	5
♀.	Kiu-Kiang	83	38	43	8	5
♂.	Ningpo	55	27	31	6	4
♀.	"	70	34	38	7	5

List of the Specimens.

1–2. Hgr.	S. slope of Khingham Mts., E. Mongolia.	G. E. Mason, Esq. [P.].
3. ♀.	Broughton Bay, Corea.	G. E. Mason, Esq. [P.].
4. ♀.	Gensan, Corea.	J. H. Leech, Esq. [P.].
5. ♀.	Japan.	J. H. Leech, Esq. [P.].
6–8, 9–10.	Japan.	Leyden Museum.
11–17. ♂, ♀, & yg.	Central Japan.	Dr. J. Anderson [P.].
18. ♀.	Yokohama.	Dr. J. Anderson [P.].
19. ♂.	Hakone Lake, Japan.	Dr. J. Anderson [P.].
20. ♂.	Great Loo Choo Island.	G. E. Mason, Esq. [P.].
21–28. ♂, ♀, hgr., & yg.	Chefoo.	R. Swinhoe, Esq. [C.].
29–34, 35–37, 38–39. ♂, ♀, & hgr.	Shanghai.	R. Swinhoe, Esq. [C.].
40–41. ♀ & hgr.	Mountains north of Kiu-Kiang.	A. E. Pratt, Esq. [C.].
42, ♀.	Chusan.	
43–44, 45. ♂, ♀, & yg.	Ningpo.	R. Swinhoe, Esq. [C.].
46–48. Yg.	Bangkok, Siam.	G. E. Mason, Esq. [P.].

2. Notes on some Ungulate Mammals. By Oldfield Thomas, F.Z.S.

[Received May 28, 1891.]

The following notes have been put together during the preparation of a list of the specimens of Ungulata in the British Museum Collection, and it is hoped they may help to clear up some of the difficulties in the systematic arrangement of these animals.

1. The Chevrotains.

The species of *Tragulus* appear to be rather less in number than was admitted by Prof. Milne-Edwards in his monograph of the group[1], as *T. kanchil* does not seem to be separable from *T. javanicus*. The authors' names also used by Prof. Milne-Edwards want some revision, as in two out of the four species the first mention of the animal was unaccompanied by a Latin binomial name. The following synopsis shows briefly the characters, ranges, and proper names of the four species which deserve recognition:—

A. Body not spotted with white. Skin between rami of lower jaw naked, glandular. Malayan.
- *a.* Dark smoky-grey, belly greyish white without rufous or fulvous edging.
  - *a*¹. Size large, hind foot with hoofs 140–150 millim.
    Hab. S. Tenasserim, Malay Peninsula, Sumatra, and Borneo........................ 1. *T. napu*, F. Cuv.[2]
- *b.* Rufous, at least on sides and along edges of belly.
  - *b*¹. Bright rufous above; back of neck not darker than the rest of the upper surface. Size medium; hind foot about 130 millim.
    Hab. "Sunda Islands" (*Milne-Edwards*) ...... 2. *T. stanleyanus*, Gr.
  - *c*¹. Greyish above, brightening to rufous on sides. A darker line, sometimes nearly black, along nape of neck. Size small; hind foot 110–125 millim.
    Hab. Camboja, Cochin China, S. Tenasserim, Malay Peninsula, Sumatra, Borneo, and Java .... 3. *T. javanicus*, Gmel.

B. Body spotted with white. Chin and throat all equally hairy.
- *c.* Size medium; hind foot about 130–135 millim.
  Hab. India and Ceylon .... 4. *T. meminna*, Erxl.

The West-African Chevrotain, "*Hyomoschus*" *aquaticus*, Og., is, as stated by Pomel, Rütimeyer, and others[3], certainly congeneric with the fossil *Dorcatherium naui*, Kaup, described in 1836, nine years before Gray formed the genus *Hyomoschus*. The animal will therefore have to stand as *Dorcatherium aquaticum*.

2. Llamas and Alpaca.

It is clear that the generic name of this group must be Lama and not Auchenia, as Cuvier, the founder of the former name, had no more power to withdraw it than any other author. The earlier references to the two names are as follows:—

Lama, G. Cuv. Anat. Comp. i. Tabl. gén. 1800; Desm. N. Dict. d'H. N. (1) xxiv. Tabl. p. 31, 1804; G. Fisch. Zoognosia, iii. p. 351 (1814).

Lacma, Tiedem. Zool. i. p. 420 (1808).

Auchenia, Ill. Prod. S. N. p. 103 (1811); G. Cuv. R. A. i. p. 25 (1817).

Many suggestions have been made as to the true relationship that

[1] Ann. Sci. Nat. (5) ii. p. 49 (1864).

[2] The references to these names are all given in Prof. Milne-Edwards's paper.

[3] For references, see Lydekker, Cat. Foss. Mamm. B. M. ii. p. 153 (1885).

the wild and domestic forms of *Lama* bear to each other, the most generally received view[1] being that the large burden-bearing Llama (*Lama glama*, Linn.) is the domestic race of the large wild species, the Huanaco (*Lama huanachus*, Mol.[2]), and that the smaller wool-bearing Alpaca (*Lama pacos*, L.) bears a similar relationship to the Vicugna (*Lama vicugna*, Mol.[3]).

After a careful study of the external characters, skulls, and teeth of all the four forms, I have come to the conclusion that this suggestion is untenable in one respect, namely as to the origin of the Alpaca, which appears really to be, like the Llama, a descendant of the Wild Huanaco[4]. Its size, although less than that of the Llama, is far greater than that of the Vicugna; its skull and teeth wholly agree with those of the former, and the naked patches on the legs, so distinctive of the Huanaco as compared with the Vicugna, are very often, although not always, present, the exceptions being easily explainable in the case of an animal bred and selected for generations solely with an eye to the thickness and extent of its furry covering. The occasional growth of the fur over the patches is not therefore to be wondered at.

The probabilities also are much in favour of the Peruvians having domesticated one wild species only rather than two, and of their having gradually developed two races out of it, the one large, strong, and suitable for the carriage of burdens, and the other smaller in size but exceptional in its capacity for producing a quantity of useful wool.

As to the nomenclature of the different races, it may be claimed that as the Llama, Alpaca, and Huanaco are all looked upon zoologically as one species, the earliest name for any of them (*Camelus glama*, L.) should be used for that species as a whole. It appears, however, to be infinitely better that in this, as in other similar cases, the original name should be used for the domestic race, *to which it was originally given*, whether the wild race of the same species is afterwards discovered with certainty or not. Thus *Capra hircus*, Linn. (1766), antedates *C. ægagrus*, Gmel. (1789), but it would only be a source of confusion, without any benefit, were the Linnean name applied to the genuine Wild Goat.

On this principle therefore the different members of the Llama group should be:—

[1] *Vide* Burmeister, Republ. Argent. iii. pp. 457–8 (1879); and Flower, Encycl. Brit. (9) xiv. p. 738 (1882).

[2] Sagg. S. N. Chili, ed. 1, p. 317 (1782).

[3] *Tom. cit.* p. 313.

[4] This conclusion has been (with my entire knowledge and consent) utilized in Messrs. Flower and Lydekker's recent work on the Mammalia (p. 303). I think it better, however, still to publish the notes that I had previously written on the subject, as giving the reasons for an opinion which I am glad to have confirmed by two such able authorities. The same view was also suggested (with a query) by Sundevall (K. Vet. Ak. Handl. 1845, p. 292); but as he had not even seen a specimen of the Alpaca, his suggestion must be looked upon as a lucky shot.

1. LAMA HUANACHUS, Mol. The Huanaco.
  Domestic races of 1:—
    a. L. glama, L. The Llama.
    b. L. pacos, L. The Alpaca.

2. L. VICUGNA, Mol. The Vicugna.

3. THE BUSH-BUCKS (*Tragelaphus*).

The larger species of this genus were worked out by Sir Victor Brooke[1] in 1871, and the only alteration which further material renders necessary in his account is that all the specimens from W. Africa, considered by him to belong to *T. spekei*, Scl., are really referable to *T. gratus*, Scl.

This well-marked species, described from a female skin in 1880[2], nine years after Brooke's paper, was really represented then by several skulls and horns in the Museum collection, viz. the specimens referred to by him under *T. spekei* as *b*, *d*, and *e* in his "List of specimens examined." The skin *e*, however, was in so bad a condition that the colour-characters did not give rise to a suspicion of specific distinction, and without such a suspicion the horns would be not unnaturally looked upon as, and compared with, immature horns of *T. spekei*. Knowing, however, the species *T. gratus* from Mr. Sclater's excellent figures, one may always readily distinguish the horns by their shortness, stoutness, and less amount of curve, the extra twist found in *T. spekei*, which approximates that species so much to *Strepsiceros*, being never found in the oldest examples of *T. gratus*. This is well seen on a comparison of Brooke's figure of *T. spekei* (*t. c.* p. 486) with that given by Sclater (P. Z. S. 1883, p. 36) of the head of the fine Gaboon specimen of *T. gratus* now in the British Museum.

The revised ranges of the four large species appear therefore to be as follows:—

1. T. EURYCEROS, Og.

Hab. W. Africa. Liberia (*Büttikofer*); Fantee (*Mus. Brit.*); Ashkankoloo Mountains, Gaboon (*Du Chaillu, Mus. Brit.*).

2. T. ANGASI, Angas[3].

Hab. S.E. Africa. Pongola River, Zululand (*Eastwood, Mus. Brit.*); Maputa River (*Proudfoot, Mus. Brit.*); St. Lucia Bay (*Angas*; *Fellowes, Mus. Brit.*).

3. T. GRATUS, Scl.

Hab. West Africa. Kokki, Cameroons (*Allen, Mus. Brit.*); Gaboon (*Du Chaillu et al., Mus. Brit., Mus. Paris*).

[1] P. Z. S. 1871, p. 482.
[2] P. Z. S. 1880, p. 452.
[3] Gray never published any description of this species, and therefore Mr. G. French Angas's account (P. Z. S. 1848, p. 89) must be taken as the original description. The species was named after Mr. G. Fife Angas, the father of Mr. G. French Angas, C.M.Z.S.

4. T. SPEKEI, Scl.

Hab. Central and South-central Africa. Karagweh, W. of Victoria Nyanza (*Speke, Mus. Brit.*); Chobe River, Upper Zambesi (*Selous* and *Chapman, Mus. Brit.*); Lake Ngami (*Green, Mus. Brit.*; *Oswell, fide Brooke*).

The characters and ranges of these larger species may now help us in the far more difficult task of the proper systematic arrangement of the smaller forms, *Tragelaphus scriptus* and its allies. In the larger Bush-bucks the four species are separated not only by colour, number of spots, stripes, &c., but also by definite structural characters, such as the length of the hoofs, the presence or absence of tufts of hair on the body, and the form of the horns; while in the smaller ones these characters are practically all identical. So far as I can discover, it is impossible to distinguish the horns of the West-African *T. scriptus* from those of the Abyssinian *T. decula* or the Cape *T. sylvaticus*; the hoofs are of the same length in all, and the quality and distribution of the fur shows but little variation. It would appear, then, that all the smaller Bush-bucks should be united as one species, but that within this species four subspecies should be recognized, these subspecies being practically based on colour alone. *T. decula* alone is rather more distinct than the rest and might by some authors be kept specifically separate, but more material from intermediate localities is needed before this point can be satisfactorily settled, and in the meantime it seems better to range it with *T. scriptus* rather than to erect it into a sixth species of the genus, with, at the best, characters so very much less in degree than those that separate the other five.

The synonymy and characters of the subspecies of *T. scriptus* may be briefly given as follows:—

5. T. SCRIPTUS, Pall.

a. T. SCRIPTUS DECULA, Rüpp.

Antilope decula, Rüpp. N. Wirb. Abyss. p. 11, pl. iv. (1835).

Form shorter and stouter than in other subspecies. General colour more yellowish than rufous. Transverse bands nearly obsolete, but one high lateral longitudinal one present, sometimes broken into spots; haunches only spotted; dorsal line dark in both sexes. Chest and belly little darker than back.

Hab. Abyssinia. Salam River, Upper Atbara (*Mus. Brit.*); Lake Dembea (*Rüppell*).

b. T. SCRIPTUS TYPICUS, Pall.

Antilope scripta, Pall. Misc. Zool. p. 8 (1766) (*ex Buff.*).

A. phalerata, H. Sm., Griff. Cuv. An. K. iv. p. 275 (1827).

Colour bright rufous, brilliantly marked all over the body with numerous white spots and both longitudinal and transverse stripes. Dorsal band white in adult males. Chest with a blackish mane.

Hab. West, Central, and South-central Africa, covering very much the combined ranges of *T. gratus* and *T. spekei*. Senegal

(*Adanson*); Gambia (*Whitfield, Rendall*); Fantee (*Mus. Brit.*); Uganda (*Speke*); Chobe River, Upper Zambesi (*Selous*).

c. T. SCRIPTUS ROUALEYNI, Gord.-Cumm.

Antilopus roualeynei, Gord.-Cumm., Hunter's Life S. Afr. ii. p. 168 (1850).

Dark brown in the males, the transverse stripes reduced to two or three very obscure ones on the posterior part of the body, and even these sometimes absent in the oldest males, at least on the Limpopo. Spotting variable, generally less than in *T. scriptus* and more than in *T. sylvaticus*.

Hab. East Africa from British East Africa to the Limpopo. Manda Island off Witu (*Kirk*); Mombasa (*Kirk*); Lower Zambesi, east of the Victoria Falls (*Selous*); Limpopo (*Gordon-Cumming*).

Mr. Selous[1] considers the typical *roualeyni*, that found on the Limpopo, to be a slightly different form from that found on the Zambesi and the East Coast further northwards, and it is by no means impossible that the latter will hereafter be found to require varietal separation from *roualeyni*.

d. T. SCRIPTUS SYLVATICUS, Sparrm.

Antilope sylvaticus, Sparrm. Act. Holm. iii. p. 197, pl. vii. (1780).

Dark brown, with no transverse stripes in adult or young, and the spots reduced to quite a few indistinct ones on the haunches.

Hab. Cape Colony.

4. THE DWARF ANTELOPES (*Nanotragus* and *Oreotragus*).

The conclusions come to by Sir Victor Brooke in his paper on the Royal Antelope[2], are confirmed in most respects by the additional materials now available, and especially I can heartily endorse his fusion of the so-called genera *Calotragus*, *Scopophorus*, and *Nesotragus* with the earlier described *Nanotragus*. Apparently, however, the genus *Nanotragus* need not be split up into subgenera at all, if we remove from it the Klipspringer, the type of "*Oreotragus*," which Sir Victor has also included in *Nanotragus*, but which seems certainly to be worthy of separate generic rank. Thus it may be readily distinguished by its very differently shaped skull, its peculiar thick brittle hairs, and more especially by the shape of its hoofs, all the other species agreeing precisely among themselves and differing from it in these three characters. Its specific name should of course be *Oreotragus saltator*, and not *saltatrix*, the latter form being merely the feminine term applied to it when it was placed in "*Antilope*" by Boddaert. The other Dwarf Antelopes appear to form a group so natural as to be all probably placed in the restricted genus *Nanotragus*.

[1] P. Z. S. 1881, p. 752. 'Hunter's Wanderings in Africa,' p. 208 (1881). I must acknowledge my extreme indebtedness to this most valuable paper, which contains an excellent account of the Chobe, Zambesi, Limpopo, and Cape Bushbucks, drawn up from observations of many fresh specimens of both sexes and all ages.

[2] P. Z. S. 1872, p. 637 *et seqq.*

3. On a Collection of Marine Shells from Aden, with some Remarks upon the Relationship of the Molluscan Fauna of the Red Sea and the Mediterranean. By Edgar A. Smith, F.Z.S.

[Received June 10, 1891.]

(Plate XXXIII.)

The specimens hereafter catalogued were collected at Aden between tide-marks or at low water by Major J. W. Yerbury, R.A., and the Rev. A. W. Baynham. To the former the British Museum is indebted for a very valuable series of 555 specimens, and from the latter it received 160 specimens. Nearly all are in excellent condition, and much praise is due to these gentlemen for devoting so much time and trouble to their cleaning and preservation. No complete list of the Mollusca of this particular spot has yet appeared, and it is as a contribution to such a Catalogue that I venture to publish the following. Many species have already been quoted from Aden, but to have searched through the vast mass of Conchological literature which exists, in order to get together a complete list of the fauna, would have occupied more time than could at present be spared.

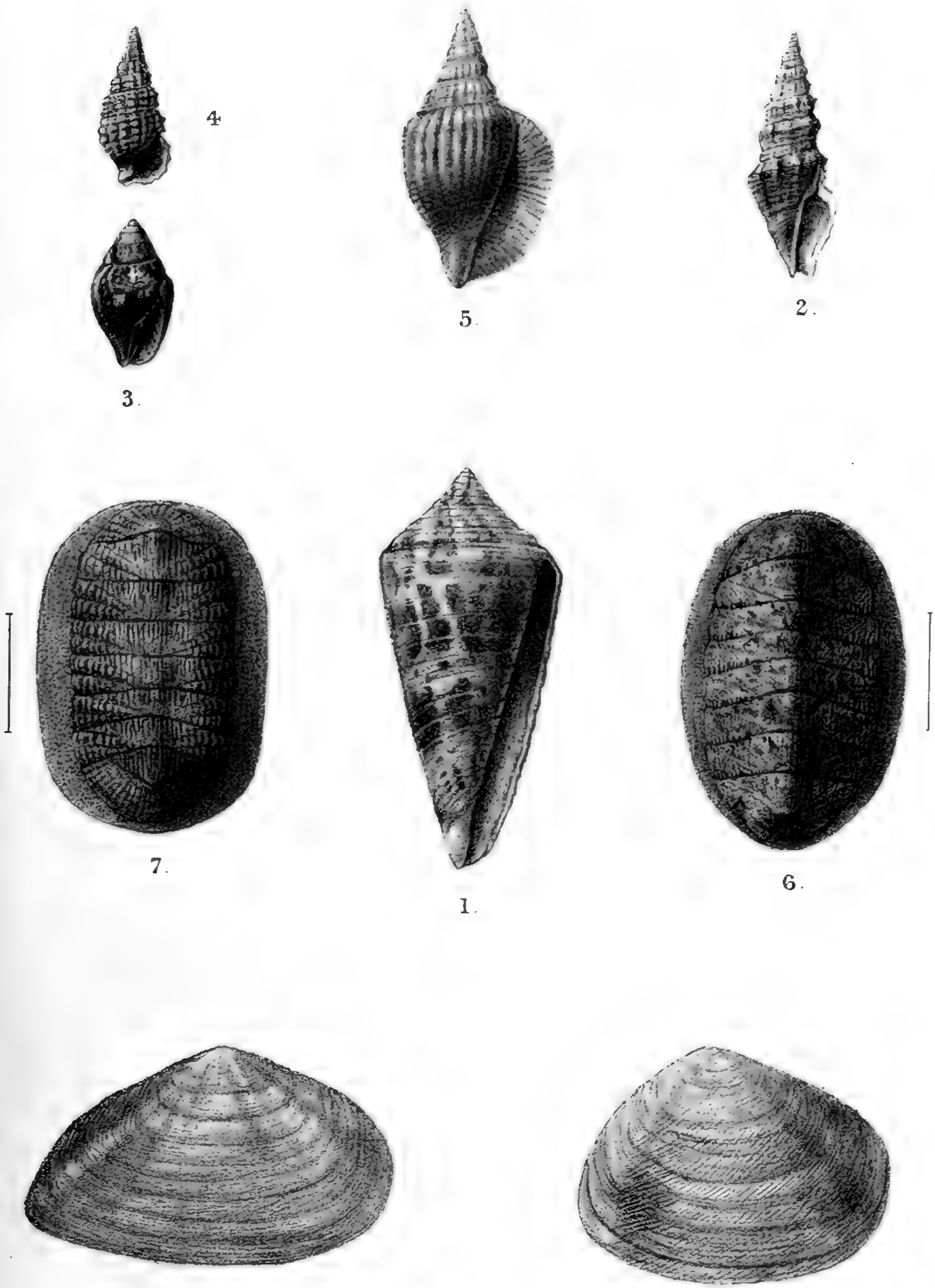
Dr. F. Jousseaume, in the 'Mémoires de la Société Zoologique de France' for 1888, has enumerated the species collected in the Red Sea and Gulf of Aden by Dr. Faurot in 1885, and among the species quoted are a number (about 26) from Aden itself. Another list of 106 species from this locality was given by G. Caramagna in the 'Bollettino della Società Malacologica Italiana,' vol. xiii. 1888.

Some of the species mentioned in these Catalogues were not met with by Major Yerbury or Mr. Baynham, and these I have given in a supplemental list at the end of this paper. The species quoted from the present collection which also appear in the works of Jousseaume and Caramagna are indicated by the locality Aden being inserted in the distribution, with the names of one or both of these writers appended.

The fauna of the Red Sea is essentially tropical, and forms the north-west limit of the Indo-Pacific fauna. The great mass of the species found at Aden have been met with at various places further up the Red Sea, and many of them occur even at the northern end, in the Gulfs of Suez and Akaba; the majority also have a wide distribution over the Indian and Pacific Region.

I have not thought it necessary to give references to all the species, most of which are well known; but it is to be understood that they are recognized as determined in the Monographic works of Reeve, Sowerby, and Küster, viz. the 'Conchologia Iconica,' the 'Thesaurus Conchyliorum,' and the 'Conchylien-Cabinet,' ed. 2.

Notes respecting the identification of certain species have been inserted when any doubt has existed, and it is trusted some of these observations may be useful, as, in many cases, they are based upon comparison of the types. The present paper may also be of some



R. Mintern del. et lith.

Mintern Bros. imp.

NEW SPECIES OF SHELLS FROM ADEN.

use to those who possess shells from this locality and are desirous of identifying them.

Before concluding these prefatory remarks I have some observations to make respecting the list of species which, according to Mr. Cooke, are "common to the Mediterranean and the Red Sea"[1]. Examples of the seventeen species he enumerates were collected in the Gulf of Suez by the late Robert MacAndrew in the early part of the year 1869, some months before the opening of the Canal. It is important to note this as showing that their establishment in the Red Sea was not of recent date. Before expressing any opinion with regard to the accuracy of some of Mr. Cooke's identifications, it was necessary for me to study the specimens themselves, and consequently I applied to Dr. Sharp of the Cambridge Museum, where the MacAndrew collection is preserved, and I have to acknowledge his kindness in forwarding all the specimens I required, and I have also to thank Mr. Cooke for kindly looking them out for transmission.

The following is the result of my examination :—

1. Cerithium (Pirenella) mammillatum, Risso.
(= *caillaudi*, Pot. & Mich.)

Nearly all the Suez specimens, which may be referred to a strongly marked variety of this species, have a peculiar facies. They have two distinct rows of granules on the upper whorls, whereas in Mediterranean specimens there are mostly three or more, and in these the granules are smaller than in the Red-Sea specimens. In the Museum we have three specimens from Bombay[2] which are more like the Mediterranean form than that from Suez.

In discussing the marine fauna of any particular sea, it is hardly correct to include the genera *Cerithidea* and *Leuconia*, the former an estuarine form and the latter an amphibious Pulmonate. Now the distribution of some of these estuarine species is most remarkable, and so unaccountable, that I think the occurrence of two forms in some parts of the Mediterranean and the Red Sea hardly bears upon the subject of distribution in question. An instance of this unaccountable distribution has lately come to my notice which may fittingly be recorded here: I refer to *Neritina crepidularia*. This unmistakable species is known from the mouth of the Ganges, from Pondicherry, Tranquebar, Ceylon, Mergui, Singapore, the Dutch Indian Islands, Philippines, Japan, Persian Gulf, and lastly from the Gold Coast, West Africa, where living specimens were collected by Mr. R. Austen Freeman and presented to the British Museum.

2. Emarginula elongata, Costa.

The specimen kindly sent me for inspection I certainly consider distinct from the above species. It bears a close resemblance to it in general appearance, and without close examination one would not

[1] Ann. Mag. Nat. Hist. 1886, vol. xviii. p. 394.

[2] *Cerithidea bombayana*, Sowerby, Con. Icon. sp. 24. Badly described and figured.

recognize the differences which distinguish it. It is a trifle shorter and higher than the Mediterranean form, but chiefly differs in the sculpture. The cancellation is coarser, the radiating ribs are peculiarly and closely imbricately squamate and thicker, and the filled-up portion of the slit is less prominent. These may be regarded by some people as varietal characters, but in answer to this I would remark that if we unite as one species forms from different seas as distinct as those from the Mediterranean and Red Sea, we should be compelled to include others also, such as *E. micans*, A. Ad., from Torres Straits, and *E. candida*, A. Ad., from Adelaide, both of which have certain points of resemblance to *E. elongata* and to each other, but which still are fairly recognizable as distinct species.

3. CHITON SICULUS, Gray.
(= *C. affinis*, Issel.)

C. affinis, Issel, may be regarded as a strongly marked form of the Mediterranean species. There is also a species found in New Zealand, *C. siculoides*, Cpr. MSS. = *C. æreus*, Reeve, which is also inseparable. *C. muricatus*, A. Adams, from Sydney, and *C. stangeri*, Reeve, = *C. insculptus*, A. Ad., from New Zealand, are likewise very similar.

4. CHITON (ACANTHOCHITES) DISCREPANS, Brown.

I cannot separate *C. scutiger*, Ad. & Reeve., Corean Archipelago, and *C. carinatus*, A. Ad. & Angas, from Port Jackson, from this species.

5. VOLVULA ACUMINATA (Brug.).

The two specimens obtained by Mr. MacAndrew are more slender than this species and agree in form with *V. angustata*, A. Adams, from the Philippine Islands, and *V. cylindrica*, Smith, from Whydah, West Africa, which apparently is the same species.

6. PHILINE APERTA (L.).

P. orientalis, A. Adams, and *P. angasi*, Crosse, both Australian, are inseparable from this species, which also occurs at Natal (Cooke).

7. (LEUCONIA DENTICULATA, Mont.)

Not considered.

8. PECTEN VARIUS, Linn.

Mr. MacAndrew collected three specimens which he considered belonged to this species. Of these Mr. Cooke[1] informs us that one is undoubtedly a worn shell of *P. senatorius*, Gmel. This I fully

[1] Ann. Mag. Nat. Hist. 1886, vol. xvii. p. 134.

admit. With regard to the two others he observes :—"I quite agree that they are undistinguishable from the common *varius* of our coasts. Even M. Fischer, who only finds three species common to the Mediterranean and Red Sea, admits as much (Journ. de Conch. 1871, p. 225)."

Having most carefully studied the two shells referred to (only 13 millims. in length!), I have no hesitation in pronouncing them young examples of *P. senatorius*. One of them distinctly exhibits the red curved lines upon the ribs which are so characteristic of typical specimens of this species, and which are chiefly visible upon the pale blotches which variegate the surface. The second specimen agrees with the others in all respects excepting colour. It is of an orange tint, varied with obscure pale markings.

With regard to the latter portion of Mr. Cooke's comment I may point out that M. Fischer should not be accredited with the view that "only three species are common to the Mediterranean and the Red Sea." He is only reviewing a paper by MacAndrew and states "*il* n'en a trouvé que 3 identiques."

9. Lima inflata, Chemn.

Only a few valves have as yet been quoted from Suez. This species also occurs at the Philippines, for specimens from this locality exist in the British Museum. Another Mediterranean species, *L. squamosa*, has been shown [1] to have a world-wide range. *L. rotundata*, Sowerby, from South Africa may be regarded as a variety of the present species.

10. Spondylus gæderopus, Linn.

Mr. Cooke considers this species synonymous with *S. aculeatus*, Chemn.! He remarks :—"It is perhaps from want of critical power that I am quite unable to separate these specimens [correctly identified by MacAndrew with *S. aculeatus*, Chemn.] from the well-known Mediterranean *gæderopus*, Lam." [2] This sentence is hardly comprehensible, for if there is one species in the genus *Spondylus* more easy of recognition than any other, it is *S. gæderopus*. This is not the place to discuss the differences which separate this species and *S. aculeatus*, but I would remark they are so obvious that I cannot imagine any conchologist failing to perceive them.

S. aculeatus is quoted from the Red Sea by Chemnitz; it is common in the Gulf of Suez (Vaillant) and it is also known from the Gulf of Akaba (Arconati) and Mauritius (MacAndrew).

11. Modiolaria marmorata, Forbes.
(=*cœnobita*, Vaill.)

The shells from Suez, specimens of which are before me, presented

[1] Lischke, Japan. Meer. Conch. vol. i. p. 162; Smith, 'Challenger' Lamellibranchiata, p. 287.

[2] Ann. Mag. Nat. Hist. 1886, vol. xvii. p. 136.

to the British Museum by Mr. MacAndrew, certainly are like *M. marmorata*, but more profusely ornamented with colour-markings than the Mediterranean form.

If we unite these two so-called species, we must also include *M. cuneata*, Gould, from the Cape of Good Hope [1], and *M. cumingiana*, Dunker, from Australia and the Red Sea; the former "differing chiefly [from *marmorata*] in being of a brownish or rosy colour instead of pale green" (Gould) [2], and the latter being of larger dimensions and somewhat more coarsely sculptured than normal specimens of *marmorata*.

However, I believe those forms, at all events three of them (*M. cuneata* I am doubtful about), are quite recognizable and may therefore be left separate.

12. Arca lactea, Linn.

This species ranges as far north as Great Britain; it occurs in the Mediterranean and along the West Coast of Africa; it is recorded from Port Elizabeth by Sowerby, and from the Natal Coast by Krauss (specimens from the latter locality are in the British Museum); and, finally, Mr. Cooke remarks that it "occurs in the Philippines in a form precisely identical with that found at Suez."

13. Venerupis irus, Linn.
(=*macrophylla*, Desh. &c.)

V. macrophylla and *V. irus* are certainly identical. The former was originally described from the Philippine Islands, and has since been quoted from the Persian Gulf (MacAndrew) and Aden (Jousseaume, and Yerbury Coll.).

14. Petricola lithophaga, Retzius.
(=*hemprichii*, Issel.)

Doubtless Mr. Cooke is right in considering these two names as belonging to one and the same species, and I fully admit the correctness of his supposition that *P. chinensis*, Deshayes, and *P. bipartita* of the same author, respectively from the China Sea and the Philippine Islands, are merely slight variations also. They had previously been considered synonymous with *P. lithophaga* by Tryon (Amer. J. Conch. vii. p. 257), who also, rightly I think, includes *P. typica*, Jonas, which has been recorded from South Africa by Sowerby (Journ. of Conch. vol. vi. p. 157).

The MacAndrew specimens are exactly like the form *bipartita*. Jousseaume quotes this species, as *P. hemprichi*, from Aden.

[1] A specimen obtained by the 'Challenger' at Port Jackson more resembles *M. marmorata* than *M. cœnobita*.

[2] Gould states that his species, like *P. marmorata* and *P. cœnobita*, occurs "imbedded in the test of a large Ascidian," a fact of which Mr. Cooke seems to have been unaware.

15. Tellina balaustina, Poli.
(=*isseli*, H. Ad.)

"Quite undistinguishable from *balaustina*, Poli. I have examined large series of each without detecting any difference" (Cooke). On the contrary, H. Adams (P. Z. S. 1870, p. 790), who had ample or the same material before him, observes of his *T. isseli*:—"This species very much resembles *T. balaustina*, Linn., but the posterior side is somewhat more angulated, and the concentric striæ, which are less numerous, are much stronger." These points of difference certainly do exist in the specimens from Suez, and I also notice that the form is rounder and the hinge-teeth proportionally stronger. I am therefore at present inclined to regard these two forms sufficiently specifically distinct.

16. Gastrochæna dubia, Penn.
(=*rüppellii*, Desh.)

This species undoubtedly occurs in the Red Sea (*rüppellii*), at Singapore (*indistincta*, Desh.), and the Philippines (*lamellosa*, Desh.). On comparing the types of the three Deshayesian species with specimens of *G. dubia*, I fail to discover any essential differences.

17. ? Pholas dactylus, L.
(=*erythræa*, Gray.)

Of this species (*erythræa*) Mr. Cooke writes—"It seems very doubtful whether the type shell at the Brit. Mus., from which this [1] has been named, is anything more than *dactylus*, L." Now Gray correctly described his species as a *Barnea*, and this alone should have been sufficient to indicate its distinctness from *P. dactylus*. I have examined the types (two valves) of *erythræa* and find that they are identical with *B. manillensis* of Philippi from the Philippine Islands. We may therefore dismiss from our minds the notion that *P. dactylus* occurs in the Red Sea.

A perusal of the above observations shows that three of Mr. Cooke's identifications I regard as entirely erroneous, namely:—

1. *Pecten varius*	should be	*P. senatorius*.
2. *Spondylus gæderopus*	,,	*S. aculeatus*.
3. *Pholas dactylus*	,,	*Barnea manillensis*.

Four species, although closely resembling Mediterranean forms, I regard as sufficiently distinct for specific separation, viz.—

1. *Emarginula elongata*	should be	*E.* sp. nov.
2. *Volvula acuminata*	,,	*V. angustata*.
3. *Modiolaria marmorata*	,,	*M. cœnobita*.
4. *Tellina balaustina*	,,	*T. isseli*.

[1] MacAndrew's one valve.

The remaining eight species[1] are evidently correctly assigned:—

1. *Chiton siculus.*
2. ,, *discrepans.*
3. *Philine aperta.*
4. *Lima inflata.*
5. *Arca lactea.*
6. *Venerupis irus.*
7. *Petricola lithophaga.*
8. *Gastrochæna dubia.*

The subject of the relationship of the Faunas of the Mediterranean and Red Seas is most attractive, and has been more or less fully discussed by R. A. Philippi, Paul Fischer, R. MacAndrew, A. Issel, and A. H. Cooke.

Certain species have been regarded by some of these authors as common to the two seas, and it has been conjectured by them that an intermingling of the faunas of these seas has occurred in past ages when a junction of their waters apparently existed. Species which are commonly regarded as Mediterranean, and which occur in the Gulf of Suez, are supposed to have gradually migrated southward, and, when the two seas became separated, to have established themselves as permanent inhabitants of the warmer waters.

Now, after a careful study of the geographical distribution of these species, finding that all exist also far east in the Indian Ocean, having a much greater range in this direction than through the Mediterranean and some distance into the Atlantic, and considering the Indo-Pacific character of the Red-Sea fauna, it seems to me equally or more reasonable to suppose that the Mediterranean specimens were derived from a Red-Sea source than *vice versâ*. It may be urged in opposition to this theory, how is it that such and such species have been found at Suez only, and at no other part of the Red Sea? The answer to this is simply, that the shores of the Red Sea have only been cursorily examined in a few places, and I fully anticipate that, whenever other more southern parts have been as well investigated as the Gulf of Suez, most of these species will be met with. Already two out of the eight have been recorded as far south as Assab.

Geographical distribution of species is such an enigma in many cases that one feels reluctance in launching forth any theory whatever. Some species, as far as our present knowledge of them extends, appear to have an almost unlimited range; whilst, on the contrary, other allied forms seem to be equally restricted. As examples, I may instance *Arca lactea* and *A. olivacea*. The former little species ranges through the Mediterranean into the Atlantic as far north as this country, southward along the West Coast of Africa past the Atlantic Islands to Ascension Island, on to the Cape of

[1] The *estuarine* forms *Cerithium mammillatum* and *Leuconia denticulata* are not taken into account, as the subject under consideration is the relationship of the *Marine* faunas of the two seas. *Vide* remarks upon the former previously given.

Good Hope and Natal, and finally it is known from the Red Sea and Philippine Islands. The other species, *A. olivacea*, the distribution of which, as far as we know, is as limited as that of *A. lactea* is extensive, has at present only been recorded from the Philippines. I could multiply cases of this kind, but the one mentioned is sufficient to demonstrate the unaccountable difference in the distribution of allied forms. There seems to be an unfathomable something in their nature which permits the one to live under very varied conditions, in temperatures greatly differing, and in waters of which the chemical composition is dissimilar, and on the other hand which does not allow the other to exist excepting under special and limited conditions. It is so in the vegetable kingdom. Do we not find some plants which will grow almost anywhere, in all kinds of soil, whereas to others existence appears to be possible only amid very special surroundings? Being cognisant of such facts as these, it is with much diffidence that I have suggested the migration, so to speak, of the species in question, or some of them at least, from the Red Sea into the Mediterranean. However, taking all points into consideration, I think this supposition is likely to be as correct as the view usually entertained.

Some support to this theory is derived from a study of the emigration of species from the Red Sea to the Mediterranean and *vice versâ* since the opening of the Suez Canal. From the reports upon this subject by Fuchs [1], Keller [2], Krukenberg [3], and others, it is evident that there is a greater pilgrimage taking place northward than towards the south, and this, to some extent, is possibly attributable to the movement of the current from the Red Sea to the Bitter Lakes being faster than that from the Mediterranean southward, for there is a flow in both directions, owing to the great evaporation in the Bitter Lakes. At present two Red Sea forms, *Mytilus variabilis* and *Mactra olorina*, have been taken living at or near Port Said; on the contrary, no Mediterranean species has as yet got through to Suez, but *Cardium edule* (if correctly identified) is said to have almost reached there. Although certain species may extend northward and to the south, it yet remains to be seen if they become modified to any extent, supposing the altered temperature and chemical composition of the water into which they may have migrated permit their race to be perpetuated.

I can well imagine that eventually it will be found that all the rest of the species have as wide and very nearly the same distribution as *Arca lactea*, and therefore the possibility is suggested that their presence in the Mediterranean may have originated from the Atlantic end and not from the eastern or Red Sea extremity. Suggestive of this is the fact that specimens of the same species from the Atlantic Islands (Madeira, Canaries &c.) and the Mediterranean are absolutely identical, whereas, in some instances at all events, in the Red Sea equivalents some slight modifications are noticeable.

[1] Die geologische Beschaffenheit der Landenge von Suez. Wien, 1877.
[2] Neue Denkschrift. allgem. Schweiz. Gesellsch. 1883, vol. xxviii. pt. 3.
[3] Vergl.-physiolog. Studien, 1888, 2nd ser., 5th part, 1st half.

The following table also lends some support to this proposition. It will be noticed that, starting from Australia [1] and the Philippine Islands, all are found in the Red Sea, four at the Cape, one has been recorded from St Helena, one from Ascension, six from the Atlantic Islands, and all in the Mediterranean.

Name of species.	Australian region.	Philippines.	Red Sea.	S. Africa.	St. Helena.	Ascension.	Atlantic Is.	Mediterranean.
Chiton siculus	*	...	*	...	...	...	...	*
,, *discrepans*	*	...	*	...	...	...	...	*
Philine aperta	*	...	*	*	...	...	*	*
Lima inflata	...	*	*	*	...	...	*	*
Arca lactea	...	*	*	*	...	*	*	*
Venerupis irus	...	*	*	...	...	...	*	*
Petricola lithophaga	...	*	*	*	...	...	*	*
Gastrochæna dubia	...	*	*	...	*	...	*	*

It is quite possible that most of these species may have been carried across the Indian Ocean [2] to the Cape in various states of development, for we know that a very large quantity of pumice thrown into the sea during the eruption of Krakatoa in 1883 was drifted in that direction, indicating the course likely to be taken by larval and pelagic forms or even by adult organisms (like the last five of the above species) if attached by a byssus to, or burrowing into, floating substances like pumice. Passing the Cape they may have extended up the West-African side of the Atlantic past the Atlantic Islands [3], and so on into the Mediterranean, at the entrance of which at Gibraltar, the main strong *surface* current is from the Atlantic eastward, which would of course be favourable to the influx of species from that sea.

As I have before stated, this is all mere conjecture, and we have to assume a starting-point somewhere in the East, for which we have no grounds. The proposition that species common to the Red Sea and the Mediterranean may have originated in the East, holds good also in regard to three of the four species which I consider sufficiently different from the Mediterranean species to be regarded as distinct. Even if we consider them practically identical, as Mr. Cooke does,

[1] *Euthria cornea* was recorded from New Caledonia by Brazier in 1889, and the 'Challenger' dredged off Sydney about 10 species of Mollusca which are inseparable from N. Atlantic forms.

[2] We *conjecture* that the ocean-currents took the same direction in bygone days: what grounds have we for this?

[3] *Vide* my reports on the Mollusca of St. Helena and Ascension Island (P. Z. S. 1890, pp. 247, 317).

we find that they have as near representatives in the Indo-Pacific. In the case of the fourth species, *Tellina isseli*, I am not aware that it has been found anywhere except in the Gulf of Suez, a fact which to some extent confirms its distinctness from the Mediterranean *T. balaustina*, considering that all the other species common to the two seas have an enormous distribution.

In the foregoing observations no reference has been made to the light which Palæontology may throw upon the subject of distribution of the species in question. It is true that most of them are found fossil in the Miocene, Pliocene, and other Tertiary rocks of Italy, Sicily, &c., a fact which would seem to indicate a long establishment in the northern hemisphere. On the other hand, a number of recent Mediterranean and Atlantic forms have already been recorded from the Tertiary deposits of Australia[1]; and we may therefore conjecture that when the Palæontology of Australia and other eastern countries has been more fully worked out, many more so-called European species will be discovered. Such being the case, I fail to perceive that the evidence afforded by Palæontology lends more support to any one of the theories of distribution set forth than to another. Probably all are wrong.

List of the Yerbury and Baynham Collections of Shells from Aden.

I. GASTROPODA.

1. CONUS SUMATRENSIS, Hwass.

Hab. Red Sea (*Reeve & others*). Gulf of Akaba (*Brit. Mus.*); Aden (*Caramagna*).

2. CONUS CAPITANEUS, Linn.

Hab. Ceylon, Philippines, Australia, New Caledonia, Polynesia, Mauritius. Andaman Is. (*Brit. Mus.*).

3. CONUS RATTUS, Hwass.

Hab. Red Sea, Ceylon, New Caledonia, Tahiti, &c. Islands of Rodriguez and Annaa (*Brit. Mus.*).

4. CONUS TESSELLATUS, Born.

Hab. Red Sea, Persian Gulf, Ceylon, Mozambique, Mauritius, Philippines, New Caledonia, Polynesia. Island of Rodriguez, Torres Straits, Fiji Islands (*Brit. Mus.*); Aden (*Caramagna*).

5. CONUS QUERCINUS, Hwass.

Hab. Red Sea, E. Africa, Mauritius, Ceylon, Philippines, Viti Islands, Sandwich Islands, New Caledonia, Friendly Islands.

Some adult specimens 80 millimetres long, obtained by Major Yerbury, are entirely without the spiral thread-like lines which occur in young shells. They are covered with a very thick fibrous or spongy epidermis.

[1] R. Etheridge, jun., Cat. Australian Fossils, 1878.

6. Conus betulinus, Linn.

Hab. E. Africa, Isle of Bourbon, Ceylon, Java, China, Philippines. Aden (*Caramagna*).

I do not agree with Tryon[1] in considering *C. suratensis* a variety of this species.

7. Conus striatus, Linn.

Hab. Red Sea, E. Africa, Ceylon, Cochin China, Philippines, Australia, New Caledonia, Viti Islands. Amirantes, Solomon Islands, Island of Annaa (*Brit. Mus.*).

8. Conus generalis, var.

Hab. Red Sea, Ceylon, E. Africa, Philippines, New Caledonia, &c.

C. maldivus, Hwass, *C. monile*, Hwass, and *C. bayani*, Jousseaume, should, I think, be considered varieties of this species, and *C. spiroglo.xus*, Deshayes, appears to be the young of it. One of the specimens from Aden is like Reeve's figure of *C. monile* (Con. Icon. f. 61), but the transverse lines are not interrupted and very much finer and thread-like. A second young example has equally fine lines, but they are interrupted and consequently form series of dots.

9. Conus acuminatus, Hwass.

Hab. Red Sea.

C. insignis and *C. multicatenatus*, Sowerby, belong to this species. The latter is placed by Tryon among the synonyms of *C. aplustre*, Reeve. Having Sowerby's type in the Museum, I am able to state that it bears no relationship to that species.

10. Conus virgo, var. thomasi, Sow.

Hab. Red Sea, E. Africa, Ceylon, Amboina, Java, Philippines, New Caledonia, Polynesia. Fiji, Tongatabu (*Brit. Mus.*); Aden (*Caramagna*). Only the variety (*thomasi*) is among the Aden shells.

11. Conus flavidus, Lamarck.

Hab. Red Sea, Persian Gulf, E. Africa, Ceylon, Java, Australia, New Caledonia, Polynesia. Mozambique, Island of Rodriguez, Torres Straits, Solomon Islands, Fiji and Tonga Islands (*Brit. Mus.*).

12. Conus inscriptus, Reeve.

Hab. Red Sea.

C. keatii, Sowerby, from the Seychelles Islands, which apparently is only a variety of this species, has the spire slightly tabulated and the tops of the whorls have more numerous spiral striæ. One of the six specimens from Aden possesses these characteristics.

13. Conus lineatus, Chemnitz.

Hab. Red Sea, East Africa, Ceylon, Philippines, Australia, New Caledonia. Andaman Is. (*Brit. Mus.*).

[1] Man. Conch. vol. vi. p. 16.

The shell described by Crosse under the name of *C. mirmillo* is not allied to this species, with which it is united by Tryon (Man. Con. vi. 44), but should be regarded as a form of *C. vulpinus*.

14. Conus catus, var.

Conus coffea, Gmelin, is probably the same as this species. *C. discrepans*, Sowerby, also appears to be a variety; and *C. adansonii*, Reeve, and *C. nigropunctatus*, Sowerby, may be regarded in the same light.

The specimens from Aden belong to the var. *adansoni*.

Hab. Red Sea, Mauritius, Java, China, New Caledonia, Polynesia. Gulf of Akaba (*Brit. Mus.*).

15. Conus erythræensis, Beck.

Hab. Red Sea.

With this species may be united *C. piperatus*, Reeve (non Dillwyn), *C. hamilli*, Crosse, *C. dillwynii*, Reeve, *C. induratus*, Reeve, *C. adustus*, Sowerby, and *C. quadratomaculatus*, Sowerby.

16. Conus traversianus, Smith.

Conus traversianus, Smith, Quarterly Journ. Conch. vol. i. p. 107, woodcut; Sowerby, Thes. Conch. vol. v. p. 263, pl. 511. f. 719.

The locality of this species has hitherto remained unknown. The two specimens from Aden answer in every respect my original description. The spire, as conjectured, consists of ten whorls, which are slightly turreted. Mr. Sowerby's figure gives but a poor idea of the beauty of this shell, the form being not sufficiently tapering anteriorly, the aperture too narrow, the transverse articulated lines are not indicated, and the blotched bands are not correctly placed.

The figure in the 'Quarterly Journal of Conchology' represents the bands more accurately as regards position, but apparently they are generally more blotchy and broken up. The whorls of the spire also are slightly elevated one above the other, producing a turreted appearance.

A specimen from Amboina has recently been presented to the Museum by Mrs. Parkinson.

17. Conus adenensis. (Plate XXXIII. fig. 1.)

Testa elongato-turbinata, alba, seriebus macularum subquadratarum transversis, et zonis duabus aurantio-fuscis (altera supra altera medium infra) cincta, transversim sulcata; interstitia plus minus tuberculata; spira breviter conica, leviter concava, aurantio-fusca maculata; anfractus 12–13, *levissime turriti, infra suturam marginati, declives, lirulis tenuibus spiralibus ornati; apertura angusta, intus alba.*

Longit 48 *millim., diam. maj.* $21\frac{1}{2}$.

The colour and disposition of the markings are similar to those of *C. planiliratus*, Sowerby, from the China Sea, but the form is different, especially as regards the spire. It is a little more elevated and not nearly so concave. The upper normal whorls in the Chinese species are turreted and prettily coronated or tuberculated at the angle, and the revolving sculpture of the spire is rather stronger than in the present species, which does not exhibit any coronation above. The tuberculation upon the transverse ridges of the lower two-thirds of the body-whorl is also a good distinguishing feature.

Kiener's figure of *C. recurvus* (Coq. Viv. pl. 97. f. 4), if the outlines of the spire were the slightest less concave, would exactly represent the form of this species.

18. Conus armatus, Hwass.

Hab. Red Sea, East Africa, Ceylon, Philippines, New Caledonia, Viti Islands, Samoa Islands. Amirantes (*Brit. Mus.*); Aden (*Caramagna*).

19. Conus tæniatus, Hwass.

Hab. Red Sea, Ceylon, China, Singapore.

20. Conus minimus (auct.).

Hab. Natal, Andaman Islands, China, Philippines, Port Essington, New Caledonia (*Brit. Mus.*); Aden (*Caramagna*).

21. Conus ceylanensis, Hwass.

Hab. Red Sea, Ceylon, Mauritius, Andaman Islands, Island of Rodriguez.

These are localities for the typical form of this species.

22. Conus cuvieri, Crosse.

Hab. Red Sea (*Brit. Mus.*).

Tryon[1] could never have seen this species or he would not have placed it as a variety of *C. cervus*, with which it has no relationship. Weinkauff[2], in comparing it with *C. tulipa* and *C. geographus*, has indicated its true affinity.

The locality "Swan River," which has been quoted for this species, requires confirmation.

23. Conus textile, Linn.

Hab. Red Sea, Indian Ocean, Philippines, Polynesia. Aden (*Caramagna*).

With this species I am inclined to unite the following as varieties:—*C. vicarius*, Lamarck, *C. verriculum*, Reeve, *C. textilina*, Kiener, *C. tigrinus*, Sowerby, *C. corbula*, Sowerby, *C. scriptus*, Sowerby, *C. panniculus*, Lamarck, *C. canonicus*, Hwass, *C. rubescens*, Bonnet, *C. legatus*, Lamarck, *C. musivum*, Broderip, *C. pauluccicæ*, Sowerby, *C. condensus*, Sowerby, *C. archiepiscopus*, Hwass, *C. abbas*, Hwass.

Great as is the difference in many respects between the extreme forms, still I find it impossible to discover any permanent distinctions,

[1] Man. Conch. vi. p. 87.
[2] Conch.-Cab., Monogr. *Conus*, p. 321.

when a very large series of specimens is examined, which will separate any of these so-called species from the rest.

Sowerby (Proc. Zool. Soc. 1882, p. 120), on the other hand, observes "having had exceptional opportunities, from time to time, of examining large numbers of specimens of all the varieties, I continue to regard these last (*C. abbas*, *C. panniculus*, *C. legatus*, &c.) as species."

24. Conus nussatella, Linn.

Hab. Red Sea, East Africa, Ceylon, Java, Philippines, N. Australia, New Caledonia, Polynesia.

25. Terebra tessellata, Gray.

Hab. Pidang, Sumatra.

This species is quite distinct from *T. ligata*, Hinds, with which it is united by Tryon[1]. It is, however, identical with *T. decorata*, Deshayes. Having the *types* of the three so-called species in the Museum, I can speak with certainty upon the subject.

The specimens from Aden show that this species attains to much larger dimensions than those already quoted, the largest example having a length of 55 millimetres.

26. Terebra lamarckii, Kiener.

Hab. Zanzibar; Aden? (Jousseaume as *duplicata*).

This species is considered by Tryon and Reeve a variety of *T. duplicata*, Linné. The style of coloration, however, is very peculiar, and the longitudinal striæ are farther apart. I prefer therefore, not having as yet met with intermediate forms, to regard them as distinct species.

27. Terebra (Impages) cærulescens, Lamarck.

Hab. Red Sea, Mauritius, Philippines, Australia, Polynesia.

28. Pleurotoma violacea, Hinds, var.

Hab. Red Sea, Persian Gulf, Japan, Philippines, New Guinea, New Zealand, Australia.

The specimens from Aden are unusually large, measuring as much as 27 millimetres in length and 9 in diameter. They do not belong to the typical lilac form, but are of a very light brownish tint with white spiral ridges, one of which is more conspicuous than the rest.

29. Pleurotoma (Surcula) catena, Reeve.

This species, the habitat of which was hitherto unknown, is well distinguished by the oblique white tubercles on the middle of the whorls with brownish spots between them. They become obsolete on the body-whorl, which is ornamented with oblique streaks and

[1] Man. Conch. vol. vii. p. 26.

spots of a brownish tint. The extremity of the canal is stained with a darker tint. The upper part of the whorl is divided off by an impressed line forming an infra-sutural convex band which is more or less nodose.

This is an extremely rare species, the type in the British Museum being the only specimen previously recorded, and a single example only was obtained by Major Yerbury.

30. Pleurotoma (Drillia?) virginia, Beck.

Hab. Mouth of the Gambia (*Reeve*).

In the British Museum are four specimens from Bombay, presented by W. T. Blanford, Esq., which agree precisely with Reeve's figure and description.

Pl. tuberculata, Gray, very closely resembles this species, but the canal appears slightly longer. Tryon[1], in carrying out his system of "lumping," unites with *Clavatula muricata* this and several other species, which in my opinion should be kept separate.

31. Pleurotoma (Drillia) baynhami. (Plate XXXIII. fig. 2.)

Testa fusiformis, turrita, dilute flavo-fuscescens, pone costas fusco tincta; anfractus 12, *primi duo læves, globosi, subpellucidi, cæteri supra medium concavi, inferne convexi, infra suturam marginati, costis longitudinalibus supra medium evanidis (in anfract. penultimo* 9–10) *instructi, lirisque spiralibus tenuibus albis ornati; anfr. ultimus inferne angustatus, pone labrum varice magno convexo instructus, costis inferne attenuatis et flexuosis ornatus; apertura longit. totius* $\frac{2}{5}$ *fere æquans, intus livida; columella vix arcuata, callo tenui superne tuberculo parvo munito induta; sinus haud profundus, mediocriter latus.*

Longit. 29 *millim., diam.* 9; *apertura* $11\frac{1}{2}$ *longa,* $3\frac{1}{2}$ *lata.*

Like *Drillia suturalis*, Gray, this species has a raised fillet at the suture; but it may be distinguished by its shorter body-whorl, its more pronounced costæ, and the difference of colour. The costæ become obsolete a little above the middle of the whorls where the concavity commences, and, being traversed by a distinct white spiral thread, have a somewhat angulated appearance.

32. Murex scolopax, Dillwyn.

Hab. Red Sea, Persian Gulf; Aden (*Caramagna*).

Tryon has united with this species *M. occa*, Sowerby, and *M. macgillivrayi*, Dohrn, two forms which in my opinion are very different.

33. Murex ternispina, Lamarck.

Hab. Red Sea, Indian Ocean, China, Philippines, Japan.

I am inclined to believe with Tryon that *M. aduncospinosus* is the same as this species, but I think *M. martinianus* and *M. troscheli* should be kept distinct.

[1] Man. Conch. vol. vi. p. 229.

34. MUREX HAUSTELLUM, Linn.

Hab. Red Sea, Ceylon, Mauritius, China, Philippines. Aden (*Caramagna*).

35. MUREX (CHICOREUS) ANGULIFERUS, Lamarck.

Hab. Aden (*Jousseaume*), Red Sea, Persian Gulf, Indian Ocean, Seychelles, Bourbon, Ceylon.

In Cuming's collection is a shell, named *M. lycacantha*, Jonas (not *cyacantha* as given by Sowerby and copied by Tryon), which appears to be only a manuscript name. It evidently is the same as *M. anguliferus*.

36. MUREX (CHICOREUS) RAMOSUS, Linn.

Hab. Red Sea, Indian Ocean, Polynesia, &c.

37. MELONGENA PARADISIACA (MARTINI), Reeve.

Hab. Red Sea, Mozambique, Natal, Ceylon, Bourbon.

The epidermis of this species is quite velvety to the touch and is covered with innumerable very short glossy hairs, disposed in longitudinal series upon the lines of growth; they are invisible to the naked eye. The operculum is unguiculate, more than twice as long as broad, strong, thickened underneath along the outer margin, and has the nucleus terminal.

38. PISANIA TRITONOIDES (Reeve).

Buccinum tritonoides, Reeve, Conch. Icon. vol. iii. pl. x. f. 77.

Hab. Philippine Islands.

I cannot agree with Tryon in considering this species a variety of *P. ignea*, Gmelin. The differences of form, colour, and sculpture are, I think, sufficient to separate them.

39. TRITONIDEA UNDOSA (Linné), var.

Hab. Malacca, Australia, Philippines, Viti, Paumotus, Society Islands.

This species varies considerably in size. The specimens from Aden are very small in comparison with the shell figured by Reeve[1] from the Philippines, being only 22 millimetres in length. They differ also in the absence of the yellow margin to the aperture.

40. COLUMBELLA PROPINQUA. (Plate XXXIII. fig. 3.)

Testa acuminata, ovata, solida, olivacea, interdum aurantia, guttis et maculis albis fusco marginatis variegata; anfractus 8, *convexiusculi, læves vel obsolete spiraliter striati, ultimus basim versus distinctius transversim striatus; spira brevis, leviter concave acuminata; apertura albida vel pallide cærulea, angusta, longitudinis totius* $\frac{1}{2}$ *adæquans; labrum extus paulo incrassatum, intus denticulatum, denticulis medianis paucis cæteris majoribus; columella callo tenui induta.*

Longit. 16$\frac{1}{2}$ *millim., diam.* 9.

This species is very like *C. vulpecula*, Sowerby, but differs in

[1] Con. Icon. vol. iii. *Buccinum*, pl. viii. fig. 55.

colour and slightly in form. The labrum in that species is white within and without, and much more strongly transversely striated externally than in the present species. The latter also is a stouter shell, broader across the body-whorl at the shoulder, and consequently the spire is much more acuminate. *C. fabula*, Sowerby, and *C. pardalina*, Lamarck, are also allied species.

41. COLUMBELLA (ANACHIS) MISERA, Sowerby.

Hab. Andaman Islands, Japan, Sandwich Islands.

With this species Tryon (perhaps rightly) unites *C. zebra*, Gray, and *C. pacifica*, Gaskoin. A shell from the Andaman Islands which I described (P. Z. S. 1878, pl. 50. f. 6) under the name *C. nigricosta*, I now believe to be the same as *C. misera*.

42. COLUMBELLA (CONIDEA) FLAVA (Bruguière).

Hab. Indian Ocean, Mauritius, Réunion, Seychelles, Singapore, Japan, &c.

The Aden shells are of a purplish-brown colour variegated with whitish dots and wavy streaks. The inner dentate portion of the labrum and the columella, with the exception of the upper part which is white, are rose-purple. The epidermis has a somewhat silky appearance and is disposed in longitudinal close-set shreds.

43. ENGINA (PUSIOSTOMA) MENDICARIA (Linné).

Hab. Red Sea, Zanzibar, Mauritius, Madagascar, Amirantes, Philippines, Australia, Polynesia. Gulf of Akaba, Christmas Island, Mergui Archipelago, Solomon Islands (*Brit. Mus.*).

44. EBURNA VALENTIANA, Swainson.

Hab. Red Sea and Persian Gulf. Aden (*Jousseaume*).

This is not the *Nassa molliana* of Chemnitz as supposed by Sowerby[1] and Tryon[2]. Chemnitz describes his species in the fourth volume of the 'Conchylien-Cabinet,' pp. 15–18, and figures it on pl. 122. fig. 1119. The shell there depicted is the well-known *E. zeylanica*. Sowerby evidently never read Chemnitz's text, but appears to have been led into the error through Chemnitz having inadvertently put the name *Nassa molliana* (p. 13) to figure 1118. On page 6 it is referred correctly to figure 1119.

45. BULLIA MAURITIANA, Gray.

Hab. Madagascar (*Gray*); Aden (*Caramagna*).

I quite agree with Tryon in uniting *B. grayi*, Reeve, with this species. The beautiful specimens collected at Aden by Major Yerbury are of a livid colour, glossy, with the basal carina and the aperture of a dark rich brown, and the spot at the termination of the sutural callus is also deep brown. The largest specimen is 52 millim. long, whilst the gigantic example referred to by Reeve under *B. grayi*, which has been in the Museum fifty years, is 64 millim. in length.

[1] Thesaurus Conch. vol. iii. p. 69. [2] Man. Conch. vol. iii. p. 213.

46. BULLIA (LEIODOMUS) LINEOLATA (Wood).

1828. *Buccinum lineolatum*, Wood, Index Test. Suppl. p. 12, pl. 4. f. 22.

1834. *Buccinum politum* (Deshayes from Lamarck), Bélanger's Voy. Indes Orientales, Zool. p. 431, pl. iii. ff. 1, 2.

1840–1850. *Buccinum bellangeri*, Kiener, Coq. Viv. p. 34, pl. 14. f. 48.

1846. *Bullia belangeri*, Kiener, Reeve, Con. Icon. pl. ii. f. 8 *a–b*.

Hab. Aracan, Ceylon.

I do not know the exact date of Kiener's publication, but there is no doubt that it appeared some years after Wood's Index. Wood's type is in the British Museum.

47. BULLIA (LEIODOMUS) TAHITENSIS (Gmelin).

Buccinum australe, Chemnitz, Conch.-Cab. vol. x. p. 178.

Buccinum australe otaheitensi, id. l. c. p. 202, pl. 154. f. 1477.

Buccinum tahitense, Gmelin, Syst. Nat. p. 3498; Wood, Index Test. p. 111, pl. 23. f. 109.

Bullia taheitensis (Gray, MSS.), Reeve, Conch. Icon. f. 11.

This species has not, I believe, been recorded from any special locality of recent years, and the original habitat, "Otaheite (*Chemnitz*)," has not been confirmed. The figure of this shell in Tryon's 'Manual' is not worth quoting, the drawing being very bad and the colour simply disgraceful; in fact the colouring of the figures in the whole of this volume (vol. iv.) is so utterly ridiculous that not the slightest attention should be paid to it. Dabs of blue, smears of pink, washes of green, &c., &c. seem to have been applied haphazard; indeed the production of a nursery would be as near reality.

48. BULLIA (LEIODOMUS) KURACHENSIS, Angas.

Bulla (*Leiodomus*) *kurrachensis*, Angas, Proc. Zool. Soc. 1877, p. 229, pl. 54. f. 6.

Bullia (*Pseudostrombus*) *kurrachensis*, Tryon, Man. Conch. vol. iv. pl. 6. f. 90.

Hab. Kurrachee, N.W. coast of India.

Besides the type presented to the Museum by the late G. F. Angas, Esq., there are three specimens also from Kurrachee in the Cumingian Collection. The specimens from Aden are very pale brown.

49. NASSA PULLUS (Linné).

Hab. Red Sea, Java, Philippines, Aden (*Caramagna*).

50. NASSA LENTIGINOSA, A. Adams.

Hab. Philippines.

With this species I would unite *N. punctata*, A. Adams, and *N. velata*, Gould. It is considered by Tryon [1] a form of *N. grandiosa*,

[1] Man. Conch. vol. iv. pp. 34–5.

Hinds, with which species he unites a considerable number of what, to my mind, are quite distinct species.

51. Nassa albescens, Dunker (var. fenestrata, Marrat).

Hab. Red Sea, India, Ceylon, Seychelles, Singapore (*Brit. Mus.*); Mozambique, Philippines, Moreton Bay, Australia (*Marrat*).

The above are the localities for the variety *fenestrata*. I am not sure that the shell figured by Reeve (Con. Icon. f. 100) is the same species as that described by Dunker under the name *albescens*. The latter is stated to be West-Indian, and although Reeve also quotes West Indies, the specimen he figures was probably Australian, as it agrees precisely with specimens in the Museum from that region.

52. Nassa coronata (Linn.).

Hab. Natal, E. Africa, Seychelles, Andaman Islands, Darnley Island (*Brit. Mus.*). Other localities are Madagascar, Java, Philippines, &c.

53. Nassa gemmulata, Lamarck, var.

Hab. Red Sea, Muscat, Japan, Philippines, Cape York, New Guinea, Queensland. Aden (*Caramagna*).

The shells from Aden belong to the variety described by A. Adams under the name of *N. verrucosa*. They are considerably larger than Adams's type as figured by Reeve (Conch. Icon. f. 36).

54. Nassa fissilabris, A. Adams.

Hab. Philippines.

This species is peculiar on account of the unusually distinct sinus at the upper end of the labrum and for the development of the callosity above it. It is perfectly distinct from *N. nodicostata* and *crenolirata* of A. Adams and *albipunctata*, Reeve, which are all united by Tryon[1], but which I consider separate well-defined species.

55. Phos roseatus, Hinds.

Hab. Philippines.

Only a single specimen was found by Major Yerbury.

56. Rapana bulbosa, Solander.

Hab, China, Japan, Philippines. Red Sea, Kurachee, Singapore (*Brit. Mus.*).

57. Purpura rudolphi, Lamarck.

Hab. Philippines, Natal.

58. Purpura hippocastanum, Lamarck.

Hab. Red Sea, Seychelles, Amirantes, Mergui, Japan, Philippines, N.E. Australia, Fiji, and New Zealand (*Brit. Mus.*).

Many other localities have been quoted for this species. The synonymy given by Tryon (Man. Conch. vol. ii. p. 162) is so ridiculous that it is beneath criticism.

[1] Man. Conch. vol. iv. p. 40.

59. Purpura mancinella (Linn.).

Hab. Philippines, Ceylon, Mergui, Amboina, Bay of Muscat.

P. echinata, Blainville, and *P. ægrota,* Reeve, united by Tryon (Man. Conch. vol. ii. p. 164) with this species are certainly distinct.

60. Purpura tissoti, Petit.

Purpura tissoti, Petit, Journ. de Conch. 1852, p. 163, pl. vii. ff. 4 *a–b*.

Cantharus tissoti, Tryon, Man. Conch. iii. p. 164.

Pisania tissoti, id. op. cit. vol. ii. p. 258.

Hab. Bombay (*Petit & Brit. Mus.*).

This species is a true *Purpura*, having the typical operculum of the genus. It is most surprising that Tryon could see in it any relationship to the genus *Cantharus*.

61. Sistrum tuberculatum (Blainville).

Hab. Red Sea, Indian Ocean, Mozambique, Japan, N.E. Australia, Solomon Islands, &c. (*Brit. Mus.*).

Other localities in the Indian and Pacific Oceans have been recorded (*vide* Smith, Voy 'Alert,' p. 52).

62. Sistrum undatum (Chemnitz).

Hab. Andaman Islands, Tranquebar, Singapore, West & N.W. Australia, Louisiade Archipelago, China, Japan, New Caledonia, &c.

63. Sistrum fiscellum (Chemnitz).

Hab. Red Sea, Philippines. Natal and Polynesia (*Cooke*).

64. Sistrum chrysostoma (Deshayes).

Ricinula chrysostoma, Deshayes, Mag. de Zool. 1844, pl. 86.

Ricinula chrysostoma (part.), Tryon, Man. Conch. vol. ii. p. 191, pl. 59. f. 283.

Hab. Red Sea (*Deshayes*). Indian Ocean, Philippines, Polynesia (*Cooke*).

The Aden shells agree precisely with the Red Sea forms as described by Deshayes.

65. Sistrum elatum (Blainville).

Purpura elata, Blainville, Nouv. Ann. Mus. 1832, p. 207, pl. 11. f. 1.

Ricinula elata, Reeve, Con. Icon. fig. 27 (is a small variety).

Ricinula spectrum, Reeve, l. c. fig. 19.

Hab. New Holland (*Blainville*). Philippines (*Reeve*). Red Sea (*Brit. Mus.*).

The aperture of this species is described as white by Blainville and Reeve. In several specimens in the Museum it is pale or deep yellow.

66. Cancellaria melanostoma, Sowerby.

Hab. —— ?

The locality of this species has not been recorded in any of the monographs.

67. Cancellaria hystrix, Reeve.

Hab. Mauritius.

Two specimens collected by Mr. Baynham have the two purplish bands on the body-whorl much darker than Reeve's type.

68. Cancellaria scalarina, Lamarck.

Hab. Isle de France (*Kiener*).

The specimen from Aden agrees very fairly with Kiener's figure [1] of this species. I am inclined to think that the shell identified by Sowerby [2] as this species is correctly determined, although Crosse [3] has held a different opinion.

69. Mitra granatina, Lamarck.

Mitra granatina, Kiener, Coq. Viv. p. 16, pl. 4. f. 10.

Mitra scabriuscula, Reeve (? *Voluta scabricula* of Linn.), Con. Icon. pl. 2. f. 35.

Hab. Philippines (*Reeve*); Viti Islands (*Tryon*).

70. Mitra ferruginea, Lamarck.

Hab. Islands of Annaa and Taheite (*Reeve*).

The specimen from Aden has the form and sculpture of this species as depicted by Reeve, but the brown colour is replaced with bright red, like that of *M. rubritincta,* which, as suggested by Tryon, is probably only a variety of this species.

71. Mitra scutulata, Lamarck.

Hab. Philippines, Mergui.

Two specimens from Aden are connecting-links between this species and *M. amphorella,* Lamarck. They have the white zone at the upper part of the whorls like the latter and variegated markings like the former; the impressed transverse fine lines are of a red tint, and the whole surface is covered with a thin olivaceous epidermis.

72. Mitra literata, Lamarck.

Hab. "Red Sea, Java, Mauritius, S. Africa, Philippines, Polynesia" (*Tryon*).

In the two specimens from Aden the rich brown colour predominates over the white.

73. Turris intermedia (Kiener).

Hab. Moluccas (*Reeve*); Madagascar (*Kiener*); East Coast of Africa, Nicobar Islands, Ceylon, Malay Archipelago (*Martens*).

[1] Icon. Coq. Viv. pl. 5. f. 3.
[2] Thes. Con. vol. ii. pl. 96. f. 88.
[3] Journ. de Conch. 1861, vol. ix. p. 231.

74. Fasciolaria trapezium (Linné).

Hab. Mauritius, East Africa, Madagascar, Red Sea, Seychelles, &c.; also Philippines, Java, China.

Common at Assab and Karaman, and eaten by the natives (*Caramagna*).

75. Latirus polygonus (Gmelin).

Hab. Massaua, Dahlak Island, and Suez in the Red Sea, Seychelles, Mauritius, Philippines, Tonga Island, &c., and many parts of the Indian and Pacific Ocean.

76. Latirus (Peristernia) pauluccíæ, Canefri.

Hab. Red Sea, Mauritius.

77. Latirus (Peristernia) forskalii, Canefri.

Hab. Red Sea and Mauritius; Mozambique (*B.M.*).

78. Harpa ventricosa, Lamarck.

Hab. Many parts of the Indian Ocean, Philippine Islands; Port Curtis (*Mus. Cuming*).

79. Oliva inflata, Lamarck.

Hab. Red Sea, Persian Gulf, Madagascar, Zanzibar, Mauritius, Réunion, Seychelles, Ceylon.

80. Ancillaria albisulcata, Sowerby.

Hab. Red Sea (*Sowerby*); Indian Ocean (*Weinkauff*); Aden (*Caramagna*).

81. Ancillaria fulva, Swainson.

Hab. Red Sea.

82. Ancillaria acuminata, Sowerby.

Hab. Red Sea, Zanzibar, Seychelles, S. Africa.

83. Ancillaria ampla (Gmelin).

Hab. Red Sea, Ceylon, Mauritius, Philippines.

84. Ancillaria mauritiana, Sowerby.

Hab. Mauritius, Madagascar, New Holland.

85. Marginella obscura, Reeve.

Hab. ——? (*Reeve*).

The type of this species, presented to the Museum by Mrs. T. Lombe Taylor, is smaller than the specimen from Aden, which is $10\frac{1}{2}$ millim. in length and more conspicuously banded, agreeing very fairly with Reeve's figure.

86. Cassis glauca (Linn.).

Hab. Andaman Islands, Singapore, Philippines, Moluccas.

87. Cassis pila, Reeve.

Hab. Mergui, China, Philippines, Australia.

88. Cassis nodulosa (Gmelin).

Buccinum no. 107, Schröter, Einleitung, vol. i. p. 383, pl. 2. ff. 9 *a–b*.

Buccinum nodulosum, Gmelin, Syst. Nat. p. 3479.

Buccinum biarmatum, Dillwyn, Cat. p. 599.

Vars. = *Cassis torquata*, Reeve, Con. Icon. ff. 1 *a*–1 *c*; Tryon, Conch. Man. vol. vii. pl. 7. ff. 92–3.

Cassis vibex, var., Küster, Conch.-Cab. pl. 49. ff. 5, 6.

Var. = *Cassis erinaceus*, Bruguière, Kiener, Coq. Viv. pl. 11. ff. 21–21 *a*.

Var. = *Cassis turgida*, Reeve, Con. Icon. ff. 25 *a–c*.

Hab. Samoa or Navigators' Islands (typical form in *B.M.*); Mozambique, Red Sea, Andaman Islands (vars. *torquata* in *B.M.*); New Holland (*Reeve*); Zanzibar (*Kirk*).

The *Buccinum nodulosum* of Gmelin was founded on Schröter's figure referred to above. The shell there represented is the counterpart of the three specimens in the Museum from the Navigators' Islands, presented by Her Majesty the Queen in the year 1841. They correspond with the figure in every particular—the form, the nodose whorls, the greatly thickened lip with the tubercles along the margin, and the crenulations within are precisely similar.

The nodose variety of *C. torquata* has the outer lip rather less thickened and the crenulations or liræ within it less developed.

The stunted form of *C. vibex* (Küster, Conch.-Cab. pl. 51. ff. 5, 6) differs in having tubercles only at the anterior part of the labrum which is not lirate within; it also appears to have no dark spots around the base of the body-whorl.

89. Dolium cumingii, Hanley.

Hab. Philippine Islands, Wide Bay.

90. Dolium maculatum, Lamarck.

Hab. Ceylon, Andaman Islands, &c.

91. Dolium olearium, Bruguière.

Hab. Ceylon, Mauritius, and other parts of the Indian Ocean; Red Sea (*Dunker*).

92. Dolium luteostomum, Küster.

Hab. Japan (*Dunker, Schrenck, Lischke, Brit. Mus.*).

This species has been shown by Lischke to be the same as *D. japonicum* of Dunker. *D. favannii*, Hanley, is also the young state of this species, which, however, I am rather inclined to think has not been satisfactorily shown to be distinct from *D. variegatum*.

93. Dolium perdix (Linn.).

Hab. W. Indies, W. Africa, Indian and Pacific Oceans.

The single specimen from Aden, about an inch in length, has very fine spiral ribs, and is rather thick and strong for its size.

94. Triton ranzanii, Bianconi.

Triton ranzanii, Bianconi, Rendiconti Accad. Sci. Istit. Bologna, 1849–50, p. 43; id. Mem. Accad. 1851, vol. iii. p. 17, pl. 3. ff. 1, 2; Kobelt, Conch.-Cab. ed. 2, p. 273.

Triton tigrinus (part.), Tryon, Man. Conch. vol. iii. p. 18, pl. 10. f. 71 (copy of Bianconi).

Hab. Mozambique (*Bianconi*); Aden (*Baynham*).

This appears to be a rare species, and has not been recorded since its original discovery by Bianconi. It is quite distinct from *T. tigrinus*, with which Tryon associated it.

95. Triton pilearis (Linn.).

Hab. Red Sea, Indian and Pacific Oceans, West Indies.

96. Triton chlorostoma, Lamarck.

Hab. Indian Ocean, Philippines.

97. Triton labiosus, Wood.

Hab. Indian Ocean, Philippines, Queensland.

98. Triton trilineatus, Reeve.

Hab. Red Sea, Persian Gulf, Indian Ocean, Philippines.

This is probably merely a variety of *T. gallinago*.

99. Triton vespaceus, Lamarck.

Hab. Indian Ocean, W. Australia.

100. Triton cingulatus, Lamarck.

Hab. Swatow, China (*Brit. Mus.*): Philippines, Gulf of Suez.

101. Ranella spinosa, Lamarck.

Hab. Red Sea, Mauritius, Ceylon, &c.; Aden (*Caramagna*).

102. Ranella granifera, Lamarck.

Hab. Aden (*Jousseaume*), Red Sea, Indian Ocean, Sir C. Hardy's Island.

103. Pirula ficus (Linn.).

Hab. Indian Ocean.

A small specimen from Aden is almost entirely white, only a few very pale yellowish spots, indicating the position of the transverse pale zones, being noticeable.

104. Natica pulicaris, Philippi.

Hab. Tuticorin, S. India (*Brit. Mus.*); Mergui (*Martens*).

The locality of this species has not been recorded in any of the monographs of this genus. The series from Aden includes small specimens, such as figured by Philippi, and others as large as that figured by Reeve in the 'Conchologia Iconica' (fig. 63). The minute dotting varies in depth of colour and size, but all examples exhibit the characteristic brown mark below the umbilicus.

105. NATICA TÆNIATA, Menke.

Hab. Philippines, Japan, China, Java; Assab (*Caramagna*).

The operculum of this species has only recently been described[1]. It is strong and shelly, spirally grooved and ridged, the central portion being more elevated than the rest of the surface, and the inner edge, or that which applies to the columella of the shell, is not straight but excurved at the middle.

106. NATICA RUFA, var.

Hab. Type from Mauritius; Madagascar, Singapore; Borneo (*Brit. Mus.*).

The Aden specimens belong to the variety (*N. forskalii*, Chemnitz) which has been quoted from Mauritius (*Tryon*) and the Red Sea (*Issel*).

107. NATICA MAROCCANA (Chemnitz).

Hab. W. Indies, W. and E. Africa, Red Sea, Indian Ocean, West coast of America, &c.

108. NATICA (NEVERITA) DIDYMA (Bolten[2]).

Hab. Indian Ocean, N. Australia to Japan, E. Australia. Aden (*Caramagna* as *N. chemnitzi*).

109. NATICA (MAMILLA) MELANOSTOMA, Lamarck.

Hab. Red Sea, Indian Ocean, some parts of the Pacific. Aden (*Caramagna*).

110. NATICA (POLINICES) MAMILLA (Linn.).

Hab. Same as *N. melanostoma*; Aden (*Caramagna*).

111. NATICA (NATICINA) PAPILLA (Gmelin).

Hab. Red Sea, Indian Ocean, Moluccas.

112. SIGARETUS PLANULATUS, Récluz.

Hab. E. Africa, Indian Ocean.

113. IANTHINA TROCHOIDEA, Reeve.

The specimens from Aden correspond exactly in form with Reeve's figure.

114. RECLUZIA ROLLANDIANA, Petit.

The two specimens from Aden, and one in the Museum from

[1] P. Z. S. 1890, p. 270, pl. xxi. f. 15.
[2] *Vide* Watson, 'Report Challenger Gasteropoda,' p. 450.

S. Africa, apparently belong to this species, agreeing very fairly with the figure in the 'Journal de Conchyliologie,' vol. iv. pl. 5. f. 12. The type was obtained on the Californian coast.

115. Eulima cumingii, A. Adams.

Hab. Sandwich, Lord Hood's and Viti Islands (*Tryon*).

116. Solarium perspectivum (Linn.).

Hab. Indian Ocean, Amboyna, China Sea, &c.

117. Solarium lævigatum, Lamarck.

Hab. Kurrachee, Madagascar and other parts of the Indian Ocean.

118. Solarium (Philippia) hybridum, Lamarck.

Hab. Philippines, China Sea. Mauritius and E. Australia (*Brit. Mus.*).

119. Torinia perspectiviuncula (Chemnitz).

Hab. Indian and Pacific Oceans: Suez (*Cooke*).

The single specimen from Aden belongs to the depressed form figured by Hanley in Sowerby's 'Thesaurus,' vol. iii. pl. 254. f. 63.

Cypræa.

The following species of this genus were obtained at Aden by Major Yerbury:—

120. Cypræa pantherina, Solander.

121. Cypræa vitellus, Linn.

122. Cypræa caurica, Linn.

123. Cypræa pulchra, Gray.

124. Cypræa helvola, Linn.

125. Cypræa undata, Lamarck.

126. Cypræa turdus, Lamarck.

127. Cypræa arabica, Linn.

128. Cypræa talpa, Linn.

129. Cypræa felina, Gmelin.

130. Cypræa fimbriata, Gmelin.

131. Cypræa cruenta, Gmelin.

132. Cypræa isabella, Linn.

133. Cypræa carneola, Linn.

134. Cypræa erosa, Linn.

135. Cypræa erythræensis, Beck.

136. Cypræa annulus, Linn.

These are all well-known species, of which the distribution has been given in various monographs. More than half of them have been recorded from the Red Sea, and all are known inhabitants of the Indian Ocean. *C. cruenta* and *C. undata* are quoted from Aden by Caramagna.

137. Littorina glabrata, Philippi.

Hab. Natal and Amirantes Islands (*Brit. Mus.*).

"Payta, Peru," one of the original habitats quoted for this species, is probably one of the numerous errors of locality which occur in Cuming's collection. So far as I am aware it has never been confirmed.

138. Littorina natalensis, Krauss.

Hab. Natal and Algoa Bay (*Krauss*). Ceylon (*Brit. Mus.*).

Some specimens from Mergui received from Dr. Anderson and determined by Martens as *L. pyramidalis*, Quoy & Gaim., also belong to this species.

139. Littorina grano-costata, Reeve.

Hab. Brisbane, Queensland.

The shells described from Christmas Island under the name of *L. granicostata,* which I subsequently changed to *L. insularis,* should, I now believe, be associated with this species.

The examples from Aden are more finely granose than the typical form.

140. Planaxis breviculus, Deshayes.

Hab. Gulf of Akaba and Persian Gulf (*Brit. Mus.*). Gulf of Suez.

141. Cerithium (Vertagus) obeliscus, Bruguière.

Hab. Red Sea, Indian Ocean; China and Tonga Islands (*Brit. Mus.*). S. Africa and many parts of Indian and Pacific Oceans.

142. Cerithium (Vertagus) kochi, Philippi.

Hab. Red Sea, Indian Ocean, Japan.

Is this the *C. subulatum* of Lamarck?

143. Cerithium rüppelli, Philippi.

Hab. Red Sea. Seychelles (*Brit. Mus.*).

144. Cerithium cæruleum, Sowerby.

Hab. Red Sea, Indian Ocean; China and Tonga Islands; Aden (*Cooke*).

145. CERITHIUM COLUMNA, Sowerby.

Hab. Red Sea, Indian Ocean, Philippines, Australia, Samoa, Fiji, &c.

146. CERITHIUM TUBERCULATUM (Linn.).

Hab. Red Sea, Indian Ocean, Philippines, Polynesia.

For remarks on this and allied species see Report on the 'Alert' Collections, pp. 63, 64.

147. CERITHIUM YERBURYI. (Plate XXXIII. fig. 4.)

Testa elongata, acuminata, alba, lineis transversis nigris interruptis ornata; anfract. 10, *convexiusculi, costis longitudinalibus* (*in anfr. penult.* 9, *in ultimo tenuioribus circiter* 12) *lirisque spiralibus* (*anfr. superioribus* 3, *in ult.* 7–8 *aliisque minoribus intercalentibus*) *instructi; apertura obliqua, longit. totius* $\frac{1}{3}$ *superans; labrum extus incrassatum, intus album, leviter liratum; columella oblique arcuata; canalis brevis, obliquus.*

Longit. 19, *diam.* 7 *millim.*

In this species a few of the costæ (about two on each whorl) are more conspicuous than the rest, and one on the left side of the body-whorl which inferiorly runs into the cauda forms a boundary to it. Between this and the labrum the costæ are finer than upon the preceding whorl. The interrupted black lines fall upon the spiral ridges, which on crossing the ribs form more or less acute tubercles. In the interstices between them there are fine parallel striæ. *C. torresi*, Smith, is closely allied to this species, but more slender, and differs in detail of sculpture.

148. TURRITELLA MACULATA, Reeve.

Hab. China Sea.

The brown thread-like lines which cover the surface are more distinct in the specimens from Aden than in those from the China Sea.

149. TURRITELLA COLUMNARIS, Kiener.

Hab. Ceylon (*Reeve*); Mergui (*Martens*).

The whorls in the specimen figured by Reeve (Conch. Icon. f. 14) are unusually flat. Most examples more nearly resemble Kiener's figure of this species. The granulation of the transverse striæ mentioned by Kiener is very feeble, and can hardly be said to exist in the specimens I have examined. Two specimens from Aden are remarkably short and broad in proportion, so that at first I was inclined to regard them as a distinct species. Their colour and sculpture being the same as the typical form, I now regard them merely as a different growth of the same species.

150. MITRULARIA CICATRICOSA (Reeve).

Calyptræa cicatricosa, Reeve, Con. Icon. f. 3 *a–b*.

Hab. Philippine Islands (*Cuming*).

151. Crepidula (Ergæa) walshi, Hermannsen.

Hab. Ceylon and Singapore (*Reeve*); Assab (*Caramagna*).

152. Calyptræa (Galerus), sp. inc.

A single specimen is all I have seen of this apparently new species. It is much elevated, cap-shaped, dirty whitish externally and tinted with purple inside, especially towards the apex. It is radiately ridged and concentrically striated with wavy lines of growth. The internal process is small, slender, compressed, and placed on the side towards which the apex inclines.

153. Amalthea acuta (Quoy & Gaimard).

Hab. Indian and Pacific Oceans.

154. Strombus tricornis, Lamarck.

Hab. Red Sea, Bourbon, Seychelles, Philippines.

155. Strombus gibberulus, Linn.

Hab. Aden (*Caramagna*); Red Sea, Assab, Indian Ocean, Philippines, Polynesia.

156. Strombus luhuanus, Linn.

Hab. Red Sea, Assab, &c. as for *S. gibberulus.*

157. Strombus floridus, Lamarck.

Hab. Same as preceding species.

158. Strombus dentatus, Linn., var.

Hab. Red Sea, Indian Ocean, &c.

The specimen from Aden belongs to the variety named *S. elegans* by Sowerby. *S. ruppellii*, Reeve, is another variety.

159. Strombus yerburyi. (Plate XXXIII. fig. 5.)

Testa parva, subfusiformis, alba, plus minus lutescenti balteata; spira gracilis, producta, longit. totius $\frac{2}{5}$ *subæquans; anfractus normales circiter* 9, *superne concavi et marginati, supra medium rotunde angulati, infra angulum fere recti, longitudinaliter plicati, transversimque sulcati; plicæ vel costæ numerosæ (in anfr. penult. ad* 24, *in ultimo* 16–17, *inferne sensim evanescentibus paucis labrum versus, cæteris majoribus et magis distantibus, superneque subnodosis), paucæ supra spiram variciformes; sulci regulares, supra et inter costas continui, interstitia vix æquantes; anfr. ultimus brevis, basim versus paulo constrictus; labrum dilatatum, ad marginem anfractus superiorem productum, intus et extus incrassatum, sulcatum, ad marginem acutum; apertura angusta, alba; columella callo crenulato tenui rufo notato induta.*

Longit. 35 *millim., diam. maj.* 19.

This species recalls to mind *S. cancellatus* of Pease, a Sandwich-Island form. It differs in colour, in the greater length of the spire, its larger size, and the different tint of the columellar callus. There are three specimens of this very interesting species in the Museum, two presented by Mr. Baynham and one by Major Yerbury. The specimen in best condition exhibits a faint pinkish tint upon the upper part of the spire. Most of the pale brownish or luteous colour is upon the back of the shell, and seems to be divided up into zones by a submedian white band and a narrower one upon the angle above. The constriction of the whorls at the upper part forms a very distinct sutural margination.

160. Strombus fusiformis, Sowerby.

Hab. Aden (*Caramagna*); N. Australia (*Reeve*); Red Sea and Indian Ocean.

161. Pterocera bryonia (Gmelin).

Hab. Red Sea, Aden (*Caramagna*); Seychelles, Amirantes, Madagascar, Mauritius, Bourbon, East Africa, Ceylon, Japan, &c.

162. Rostellaria curvirostris, Lamarck.

Hab. Red Sea, Persian Gulf; Aden (*Caramagna*); Moluccas.

163. Nerita polita, Linn.

Hab. Berbera and Assab (*Caramagna*); Indian and Pacific Oceans; Aden (*Cooke*).

164. Nerita albicilla, Linn.

Hab. Aden (*Caramagna*); Red Sea, Indian and Pacific Oceans.

165. Nerita quadricolor, Gmelin.

Hab. Red Sea, Mozambique, Natal, Bombay, Java.

166. Nerita longii, Récluz.

Hab. Aden, Socotra, Bombay.

N. arabica, Reeve, is, as stated by Martens, a synonym of this species and not related to *N. chamæleon*, Linn., as supposed by Tryon.

167. Turbo radiatus, Gmelin.

Hab. Red Sea and Persian Gulf; Madagascar.

T. radiatus, Reeve (non Gmelin), = *T. elegans*, Philippi, is altogether a very distinct species.

168. Turbo (Marmorostoma) coronatus, Gmelin.

Hab. Aden, Red Sea, Natal, Zanzibar, Cochin China, Moluccas, Japan, &c.

T. granulatus, Gmel., should, I think, be considered a variety of this species. The umbilication of some specimens and the imperforate columella in others has yet to be accounted for. This difference occurs in specimens otherwise precisely similar.

169. TROCHUS (TECTUM) DENTATUS, Forskål.

Hab. Red Sea, Persian Gulf.

Both the typical form and the variety (*T. noduliferus*, Lamk.) occur at Aden. Of the latter some specimens are very large, being 69 millim. in height and 100 across the base. In these very fine examples the nodules at the periphery become somewhat obsolete upon the last third of the whorl towards the outer lip. Their opercula are 37 millim. in diameter, thin, yellowish brown, and consist of 12 whorls which enlarge somewhat rapidly.

170. TROCHUS (INFUNDIBULOPS) ERYTHRÆUS, Brocchi.

Hab. Red Sea, Gulf of Suez.

171. TROCHUS (INFUNDIBULOPS) FIRMUS, Philippi.

Hab. Persian Gulf.

172. TROCHUS (EUCHELUS) ATRATUS, Gmelin.

Hab. Widely distributed. Many parts of the Indian and Pacific Oceans.

173. TROCHUS (CLANCULUS) PHARAONIS, Linn.

Hab. Red Sea, Gulfs of Suez and Akaba.

174. TROCHUS (MONODONTA) AUSTRALIS, Lamarck.

Hab. Natal, Seychelles, Madagascar; Gulf of Suez.

All the specimens from South Africa which I have seen have stronger spiral sulci and ridges than the examples from Aden. These are nearly smooth, but precisely similar in style of colouring.

175. FISSURELLA RUPPELLII, Sowerby.

Hab. Mauritius, Red Sea, East Africa, Mergui.

176. PATELLA CHITONOIDES, Reeve.

Hab. Madagascar, Mauritius, Réunion.

177. CHITON (ACANTHOPLEURA) SPINIGER, Sowerby.

Hab. Suez (*Issel*); Aden (*Haddon*); also widely distributed in the Pacific and Indian Oceans.

178. CHITON (ISCHNOCHITON) YERBURYI. (Plate XXXIII. fig. 6.)

Testa parva, depressa, in medio leviter carinata, pallide grisea, sordido-viride maculata; areæ laterales, centrales et valva antica undique subæqualiter reticulatæ; apex valvæ posticæ subcentralis, mediocriter acutus; ligamentum squamis minutissimis indutum, roseo-griseum, sordido-viride maculatum.

Longit. 15 *millim., diam.* 8.

Only a single specimen of this species was found by Major Yerbury. The sculpture recalls that of a thimble. It is a trifle coarser on the lateral, especially along their posterior margins, than on the central areas. The dirty green spotting is also more noticeable on the hinder edges of the valves than elsewhere.

179. Chiton (Callistochiton) adenensis. (Plate XXXIII. fig. 7.)

Testa parva, depressa, haud carinata, concolor, pallide fuscescens; valva antica costis radiantibus circiter 22 granulatis instructa; areæ laterales e radiis duobus forte granulatis constitæ, centrales longitudinaliter granulose liratæ, liris in medio tenuioribus quam lateralibus, postica liris tenuibus ad 25 granulatis instructa; ligamentum pallide fuscescens, minutissime squamulatum.

Longit. 14 *millim., diam.* $9\frac{1}{2}$.

The sculpture of this species is of the same character as that of *C. antiquus*, Reeve, but not quite so pronounced, and the rays of both the terminal valves are more numerous.

180. Bulla ampulla, Linn.

Hab. Indian and Pacific Oceans, Red Sea; Aden (*Caramagna & Jousseaume*).

181. Haminea constricta, A. Adams.

H. constricta, A. Adams in Sowerby's Thesaur. vol. ii. p. 581, pl. cxxiv. f. 95.

Hab. Luzon, Philippines.

The Aden shells agree exactly with the above-quoted figure and with the types in the Museum. Sowerby's figure in the Conch. Icon. f. 16 *a–b* is not so good as his earlier illustration in the 'Thesaurus.'

182. Hydatina physis (Linn.).

Hab. Indian and Pacific Oceans, Red Sea; also West Indies and Brazil.

Remarkable as it may appear, this species undoubtedly occurs in the West Indies. In the British Museum are specimens from Jamaica received from Mr. E. Chitty and others from St. Vincent's, and recently a specimen was obtained at Pernambuco by Mr. Ramage when investigating the fauna of Fernando Noronha.

183. Hydatina circulata (Martyn).

Hab. Mauritius, Ceylon, &c. Not yet noticed from the Red Sea.

184. Umbrella indica, Lamarck.

Hab. Aden (*Caramagna*); Indian and Pacific Oceans.

II. PELECYPODA.

185. Dosinia pubescens, Philippi.

D. pubescens, Phil., Römer, Mon. Dosinia, p. 79, pl. 15. f. 1.

Hab. Philippines, New Holland, and Madagascar (*Römer*).

With this species I unite *Artemis scabriuscula*, Reeve (? of

Philippi), *D. ovalis*, Römer, *D. eunice*, A. Adams, and perhaps *D. bisecta*, Reeve. The first three species were described from specimens from unknown localities and the last was said to be Japanese.

Artemis cælata, Reeve, considered by Römer to be synonymous with *D. pubescens*, is distinct. The lunule is longer and not so deep; the posterior dorsal area is seen to be different on comparison, and the concentric ridges are more conspicuously elevated at the extremities, forming a sort of crest circumscribing not only the posterior area, but also the lunule in front. The anterior muscular impression is narrower and the hinge-plate not quite so strong as in *D. pubescens*.

D. erythræa, Römer, was described from a specimen said to have come from Aden. It certainly is the same species as *D. radiata*, Reeve, and *D. amphidesmoides*, Reeve, and the shell identified by Deshayes [1] as *D. dilatata* of Philippi also belongs to the same form. Reeve quotes "Mouth of the Gambia" as the locality for *D. radiata*, and it has been suggested by Menke and Römer that this species is the "Colan" of Adanson. I am much inclined to doubt the accuracy of this identification and also of Reeve's habitat [2]. *D. amphidesmoides* is a Philippine shell; *D. erythræa*, as stated above, is from Aden, and Deshayes's specimen of *D. dilatata* in the Museum also came from the Red Sea.

186. Dosinia alta, Dunker.

Hab. Red Sea.

187. Sunetta contempta, nom. nov.

Meroë menstrualis, Reeve (non Menke), Conch. Icon. vol. xiv. fig. 9.

This species is not the young of the Japanese *S. menstrualis* as supposed by Römer (Monog. *Sunetta*, p. 14). It is more convex, its shape is different, the ends being more equal than in Menke's species, and the valves are seen to be thicker and stronger when shells of equal size are compared. The interior is more or less purplish or purplish brown. In *S. menstrualis* the pallial sinus terminates in an *acute point*, whereas in the present species it is *rounded*.

I would here point out the shells figured both by Sowerby [3] and Reeve [4] as *S. excavata* are rather young specimens of *S. menstrualis*. Sowerby, however (pl. clxiii. fig. 17, not 16 as in text p. 742), has correctly depicted *S. excavata* by copying Philippi's figure [5] of *S. vaginalis*, which is a synonym of that species. In my opinion *S. aliciæ*, Adams and Angas, is also synonymous. *S. subquadrata* (Sowerby, pl. 129. f. 9, and Reeve, f. 7, as *vaginalis*), as suggested by Römer, may be the young of *excavata*, but it seems to be rather more oblong.

[1] Cat. Conch. Biv. Mus. Brit. part i. p. 12.
[2] Issel quotes *D. radiata* from Suez (Mal. Mar. Ross. p. 72).
[3] Thes. Conch. vol. ii. pl. 126. ff. 13, 14.
[4] Conch. Icon. *Meroē*, pl. iii. ff. 11 *a–b*.
[5] Abbild. vol. ii. *Cytherea*, pl. iii. f. 2.

Römer's figures 2*c*, 2*d*, and 2*e* do not, I think, represent young specimens of *S. menstrualis*, but in my opinion, at all events fig. 2*e*, illustrate the adult state of a distinct species, specimens of which in the British Museum from the island of Formosa bear the name of *S. cumingii*, Hanley. This species has not been described, but appears in a list of Formosan shells published by Mr. Cuming in the Proc. Zool. Soc. 1865, p. 196. It is remarkable for the radiating character of its markings, its *radiating striæ*, and concentric periodic bluish zones. The interior may be more or less violet, or white, or flesh-tint, and the pallial sinus is something like that of *S. menstrualis*, but does not converge to so sharp a point.

188. Cytherea (Tivela) ponderosa, Koch.

Hab. Zanzibar; Aden (*Caramagna*).

189. Cytherea (Callista) umbonella, Lamarck.

Hab. Brazil; Red Sea (*Lamarck*).

A single valve was all that was obtained by Major Yerbury. It is in perfectly fresh condition and of the same violet colour as the specimen figured by Reeve (Conch. Icon. *Dione*, fig. 27). I have never seen specimens from Brazil, but according to Römer it is plentiful on the coast of that country.

190. Cytherea (Callista) florida, Lamarck.

Hab. Red Sea, Persian Gulf, Mozambique, Madagascar, Seychelles; Aden (*Caramagna*).

191. Cytherea (Caryatis) hebræa, Lamarck.

Hab. Philippine Islands and New South Wales.

For remarks upon this species see the Report upon the Lamellibranchiata of the 'Challenger' Expedition, pp. 138–9.

192. Cytherea (Caryatis) yerburyi, nom. nov.

Dione erubescens, Reeve (*non* Dunker), Conch. Icon. pl. xi. fig. 54.

Hab. Ceylon (*Reeve*); Queensland (*Mr. Brazier's Coll.*); Japan (*MS. note in B.M.*)

I agree with Reeve in considering this species distinct from *C. crocea*, Desh. (=*C. deshayesii*, Pfr.), the differences in shape and sculpture, and colour also, being quite sufficient, in my opinion, to warrant its specific separation. The name *erubescens* being preoccupied by Dunker for a species from West Africa, I have substituted that of *yerburyi*.

193. Circe corrugata (Chemnitz).

Hab. Red Sea, Persian Gulf, Madagascar, New Holland; Aden (*Caramagna*).

194. Circe intermedia, Reeve.

Hab. Not previously recorded.

Several specimens from Aden prove the validity of this fine species. It is fairly constant in colour and markings, but varies somewhat in form, some specimens being rather narrower and more produced posteriorly than others. As is usual, young shells are more compressed than adult specimens.

195. Circe scripta (Linn.).

Hab. Red Sea, Indian Ocean, Moluccas, &c.

196. Circe (Crista) pectinata (Linn.).

Hab. Same as preceding species. Aden (*Caramagna*).

197. Circe (Lioconcha) callipyga (Born).

Hab. Red Sea; Aden (*Caramagna*).

All kinds of colouring exist among the specimens from Aden.

198. Venus reticulata, Linn.

Hab. Red Sea, Persian Gulf, Indian Ocean, Philippines, New Caledonia, Society and Fiji Islands.

The Aden specimens are peculiar in having the hinge-teeth white instead of red as usual. In other respects they correspond exactly with the usual type of the species.

199. Tapes sulcarius, Lamarck.

Hab. Moluccas, Indian Ocean.

200. Tapes deshayesii, Hanley.

Hab. Philippine Islands; Mauritius; Red Sea (*Issel* and *Brit. Mus.*).

The single specimen from Aden is marked very similarly to that figured by Reeve (Con. Icon. f. 4 *a*).

201. Tapes malabaricus (Chemnitz).

Hab. Malabar, Ceylon, Mergui, Moluccas, Philippines, China.

The specimens from Aden agree precisely with Reeve's *T. lentiginosa* (Con. Icon. f. 25), which I consider a form of this species. They are large strong shells with coarse concentric ridges and a well-sinuated posterior margin. The finest specimen is 72 millim. long, 57 high, and 29 in diameter. Römer[1] has considered Reeve's *T. turgidula* (Con. Icon. f. 32) a "var. monstrosa" of *T. malabaricus*; but I may point out that the shell figured by Reeve is a specimen of *T. inflata* of Deshayes, which is figured in the Proc. Zool. Soc. 1853, pl. 19. ff. 3 *a*–3 *b*. *T. inflata*, as determined by Römer, appears to be a large coarsely ribbed *T. malabaricus*. *T. inflatus* proper is perfectly smooth at the umbones and has less sinuation in the posterior ventral margin; in other respects it agrees with *T. malabaricus*.

202. Tapes obscuratus, Deshayes, var.

Hab. Philippines.

Three specimens from Aden may belong to this species. They

[1] Monogr. *Tapes*, p. 34.

are, however, larger and narrower and much more finely and closely sculptured than the normal form. They do not seem to belong to *T. araneosus*, Philippi, which is quoted by Caramagna from Aden. *T. gratus*, Desh., and *T. quadriradiatus*, Desh., should, I think, be regarded as varieties of *T. obscurata*.

203. Tapes virgineus, Linn.

Hab. "In Indiis" (*Linn.*); New Holland (*Römer*); China Sea (*Philippi*).

Römer's figure 3 *d* on plate xxxiii. of his monograph of *Tapes* represents the form of the specimen from Aden, but the colouring is not quite the same.

204. Venerupis macrophylla, Deshayes.

Hab. Philippine Islands; Aden (*Jousseaume*).

A few specimens from Aden apparently belong to this species, which A. H. Cooke unites (and probably correctly) with *V. irus*, Linn. This may be the same species as that quoted by Caramagna [1] from Assab, at the southern end of the Red Sea, under the name *Venerupis cordieri*, Desh., originally described from Californian specimens.

205. Psammotæa oblonga, Deshayes.

Psammotella oblonga, Reeve, Con. Icon. f. 7.

Hab. —— ?

The finest example from Aden is considerably larger and of thicker substance than the shell figured by Reeve. It is 83 millim. long and 41 high. The valves towards the umbones are purplish, the rest of the surface being dirty whitish. The purple tint behind the apices is much darker than in front.

206. Psammobia (Heteroglypta) corrugata, Deshayes.

Hab. Zebu, Philippines.

207. Psammobia pallida, Deshayes.

P. pallida, Desh. Proc. Zool. Soc. 1854, p. 323.

Hab. Red Sea; Malacca (*malaccana* and *suffusa*).

P. malaccana, Reeve, is a synonym of this species, and *P. suffusa*, Reeve, a variety.

208. Asaphis deflorata (Linn.).

Hab. Red Sea, Indian and Pacific Oceans; also West Indies; Aden (*Caramagna*).

209. Tellina (Tellinella) sulcata, Wood.

Hab. Philippine Islands, Red Sea; Aden (*Cooke*).

The figures in Römer's monograph of *Tellina* (Conch.-Cab. pl. 13. ff. 4, 5, 6) give a good idea of the Aden specimens. This species in Cuming's collection bears the name of *T. woodii*, Deshayes, but I do not think that this has been published.

[1] Bull. Soc. Mal. Ital. 1888, vol. xiii. p. 139.

210. TELLINA (TELLINELLA) MADAGASCARIENSIS, Gmelin.

Hab. Madagascar.

211. TELLINA (TELLINELLA) INFLATA, Chemnitz.

Hab. Philippine Islands, China Sea, Mauritius, Red Sea, east coast of Africa, Nicobars, Ceylon, &c.; Port Curtis (*Brit. Mus.*).

212. TELLINA (ANGULUS?) ADENENSIS. (Plate XXXIII. fig. 8.)

Testa planissima, oblonga, antice rotundata, postice acuminata, fere æquilateralis, roseo-albida, umbones versus plus minus aurantio tincta, postice radio albo angusto ornata; valvæ nitidæ, lineis incrementi concentricis tenuiter striatæ (striis prope marginem posticum validioribus, aliisque ad medium obliquis), intus et extus radiatim substriatæ; margo dorsi anticus leviter declivis, vix excurvatus, posticus oblique descendens, rectus, cum margine posteriore angulum obtusum formans, ventralis parum arcuatus, postice vix sinuatus; pagina interna alba, superne ante apices aurantio tincta, lira postice radiante instructa; dentes cardinales valvæ dextræ tres divergentes, in sinistra duo, laterales nulli; sinus pallii maximus, usque ad cicatricem anticam productus, supra medium valvæ angulatus.

Longit. 45 *millim., alt.* $26\frac{1}{2}$, *diam.* 7.

T. armata, Sowerby (Conch. Icon. fig. 264), the type of which is in the British Museum, is somewhat like the present species, especially in colour, but is less acuminate posteriorly and its hinder dorsal margin is not so sloping.

Besides the fine concentric lines of growth, *T. adenensis* exhibits oblique striæ upon the front half of the shell, which terminate about the middle of the valves. The striæ on the posterior dorsal slope are considerably stronger than any on the rest of the surface. The raised ridge on the inner surface of the valves, which extends obliquely from the umbones towards the posterior end of the ventral margin, forms the white ray which is so conspicuous on the outer surface. Of the three teeth in the right valve, the front one is the longest, the central smallest, and the hindmost bifid. In the left valve the posterior tooth is very thin, whilst the other, which falls perpendicular under the apex, is much stronger.

213. TELLINA (ANGULUS?) SUBPALLIDA. (Plate XXXIII. fig. 9.)

Testa inæquilateralis, oblonga, antice rotundata, postice angustata, albida, versus apices interdum pallide flavescens, zonis et lineis concentricis griseo-hyalinis picta, mediocriter compressa; margo dorsi anticus leviter obliquus, subrectilinearis, posticus valde declivis, ventralis late arcuatus, postice vix sinuatus; valvæ lineis incrementi tenuibus concentricis striatæ, striisque aliis conspicue obliquis confertis fere undique sculptæ; dentes cardinales valvæ dextræ duo divergentes, in valva sinistra unicus, *subvalidus, centralis; pagina interna nitida, radiatim obsolete striata; sinus pallii profundus, superne subangulatus.*

Longit. $18\frac{1}{2}$ *millim., alt.* 14, *diam.* 6.

This species has oblique sculpture similar to that in *T. rhomboides*, Quoy and Gaimard. It is, however, not nearly so narrow as that species, but agrees with it in dentition. Only the posterior slope is free from oblique striæ, but it has more distinct concentric lines. In certain lights the whole surface exhibits faint or subobsolete striation. When the valves are closed, the anterior dorsal slope exhibits a lanceolate lunular depression.

214. Tellina (Phylloda) foliacea, Linn.

Hab. Red Sea, Indian Ocean, Moluccas, Philippines: Aden (*Caramagna*).

215. Tellina (Macoma) dubia, Deshayes.

Tellina dubia, Deshayes, Proc. Zool. Soc. 1854, p. 371; Sowerby, Conch. Icon. pl. xlvii. p. 279.

Hab. ——?

Sowerby's figure does not represent the posterior end of this species sufficiently truncate.

216. Tellina (Metis) edentula, Spengler.

Hab. Philippines, Ceylon; China and Kurrachee (*Brit. Mus.*).

This species is *T. angulata*, Chemnitz, not of Linné.

217. Semele chinensis, A. Adams.

Hab. Indian Ocean, Mergui Archipelago, China.

Amphidesma cordiformis (Reeve, Conch. Icon. fig. 30) is the same as this species. It is uncertain whether he has correctly identified that species of Chemnitz, who gives the West Indies as the locality of his shell.

218. Semele (Iacra) seychellarum (A. Adams).

Scrobicularia seychellarum, A. Ad. Proc. Zool. Soc. 1856, p. 53.

Hab. Seychelles.

This interesting species, originally located in the genus *Scrobicularia*, was subsequently placed in a subgenus of that group named *Iacra* by H. & A. Adams. Fischer in his 'Manual' considered it a subgenus of *Syndesmya* or *Abra*. This location is, in my opinion, correct, for the dentition of the hinge and the ligament agree in detail with that group, which, however, I regard only as a subgenus of *Semele*.

219. Donax (Machærodonax) scalpellum, Gray.

Hab. Gulf of California.

The above-named locality, given by Reeve (Conch. Icon. sp. 39), has never been confirmed, and I think there is little doubt that it is incorrect. The specimens from Aden agree in form, colour, sculpture, and every other respect with that figured by Reeve. One example, however, has the ground-colour yellowish instead of bluish white.

220. Mactra decora, Deshayes.

Hab. —— ? (*Deshayes* and *Reeve*); New South Wales (*Weinkauff*); Assab and Berbera (*Caramagna*); Mergui (*Martens*).

With this species I have no hesitation in uniting *M. jickelii* of Weinkauff from Massowa on the coast of Abyssinia.

221. Mactra fauroti, Jousseaume.

M. fauroti, Jousseaume, Mém. Soc. Zool. France, 1888, vol. i. p. 200.

Hab. Aden (*Jousseaume*).

The shell figured by Weinkauff (Conch.-Cab. *Mactra*, pl. 19. figs. 5, 6, 7) as *M. pulchra*, Gray, evidently belongs to the present species.

222. Mactra (Merope) ægyptiaca, Chemnitz.

Hab. Red Sea (*Chemnitz*); Ceylon (*Reeve*).

223. Cardium rugosum, Lamarck.

Hab. Madagascar, Red Sea, East Africa, Ceylon, North Australia, Philippines, &c.

224. Cardium rubicundum, Reeve.

Hab. Zanzibar.

225. Cardium setosum, Redfield.

Hab. China, Philippines.

226. Cardium australis, Sowerby.

Hab. South Africa, Mauritius, China, Australia; Assab? (*Caramagna*).

227. Solen truncatus, Wood.

Hab. Ceylon: Aden (*Jousseaume*).

Both in the 'Conchologia Iconica' and in the 'Conchylien-Cabinet,' Sowerby is given as the author of this species. This is incorrect, as part 32 of Sowerby's 'Genera of Recent and Fossil Shells,' which contained the account of *Solen*, did not appear until 1829, whereas this species had already (1825) been figured by Wood under the name of *Solen truncatus*. Sowerby's 'Genera' was not published in 1820–25 as appears on the titlepage, for reviews of Numbers 29, 30, and 31 appeared in the 'Zoological Journal,' 1828, vol. iii. p. 284, and in Loudon's 'Magazine of Natural History,' vol. i. (1828) p. 56, vol. ii. (1829) p. 50. I am not aware when the work was completed, but I dare say it could be ascertained by searching for reviews of it. Unfortunately, the original covers of the Numbers were only dated in a few instances; for example, Number xxxiii. is dated 1st March, 1831, Number xxxv. 30th April, 1831. In the text relating to *Purpura*, published in Part 42, reference is made to Gray's genus *Pollia*, described in the 'Zoology of Beechey's

Voyage,' 1839. This seems, therefore, to prove that the work in question was not completed until after that date.

228. SILIQUA JAPONICA, Dunker.

Aulus japonicus, Dunker, Proc. Zool. Soc. 1861, p. 426.
Cultellus ——, Sowerby, Conch. Icon. pl. v. f. 15 *b* (*non* 15 *a*).
Machæra japonica, Clessin, Conch.-Cab. p. 63, pl. 18. f. 5.
Hab. Japan.

The shell figured by Sowerby (fig. 15 *a*) is in the Cumingian collection labelled "*pulchra*, Gould," and not "*pulchra*, Dunker," as stated in his synonymy. It seems to me different from *S. japonica*, for although the colouring is very similar in both species, *S. pulchra* has the umbones more excentric and has not the keel-like ridge which defines the dorsal area in *S. japonica*. "*S. pulchra*, Gould," is given in Conrad's Catalogue of Solenidæ [1] without any reference, nor have I been able to discover where it was described.

229. TUGONIA NOBILIS, A. Adams.

Hab. Assab, Kamaran (*Caramagna*).

This species is very like the West-African *T. anatina*, and seems distinguished merely by the absence of radiating striæ anteriorly. It is very variable in form, some specimens being much more globular than others. "West Africa," assigned to this species in the 'Conchologia Iconica,' may not be incorrect, although we scarcely expect to find the same species at Senegal and Aden.

T. semisulcata, A. Ad., I regard as the young of this species, and *T. siphonata*, Reeve, and *T. compressa*, Reeve, are likewise young specimens of *T. anatina*, Gmelin.

230. VENERICORDIA ANTIQUATA (Linn.).

Hab. Ceylon.

231. VENERICORDIA CUMINGII, Deshayes.

Hab. Borneo.

This species, described in the Proc. Zool. Soc. 1852 (p. 102, pl. 17. f. 15), is not so pointed posteriorly as the preceding. In other respects it is very similar, and it is probable that the two forms pass one into the other. *V. canaliculata*, Reeve, appears to be another form of the same species.

232. CARDITA (BEGUINA) GUBERNACULUM, Reeve.

Hab. Zanzibar, Madagascar.

233. LUCINA (CODAKIA) EXASPERATA, Reeve.

Hab. Honduras (*Reeve*). New Caledonia, N. Australia, Amirantes Islands, and Red Sea (*Brit. Mus.*).

The Caribbean locality has not yet been confirmed, but it is quite possible it may be correct, for another well-known species of this

[1] Amer. Journ. Conch. vol. iii., Appendix, p. 23.

genus, *L. tigrina*, as pointed out by Cooke [1], is also found both in the West Indies and in the Indian Ocean.

234. Corbula taheitensis, Lamarck.

Hab. Tahiti; New Guinea (*Brit. Mus.*); Philippine Islands (Reeve, Conch. Icon. sp. 15).

235. Galeomma, sp.

A single valve obtained by Major Yerbury is very like *G. formosa*, Deshayes, but rather more glossy and of a bright yellow colour.

236. Diplodonta rotundata, Turton.

The three specimens from Aden appear to me inseparable from this European species. It is quoted by Caramagna from Zeila and Berbera.

237. Martesia striata (Linn.).

Hab. "England, West Indies, Philippines" (*Tryon*); Arafura Sea ('*Challenger*').

238. Mytilus pictus, Born.

Hab. N.W. Africa to the Cape of Good Hope. Aden (*Caramagna*).

The range of this species (=*M. afer*, Gmelin) is about the same as that of *M. perna*, Linn., and I am inclined to believe that both forms belong to one and the same species. The three specimens from Aden, although not typical examples, evidently belong to this species. Three shells in the Cumingian collection labelled "*taprobanensis*, Blanf. MSS., Galle, Ceylon," apparently belong to this species also.

239. Mytilus senegalensis, Lamarck.

Hab. Senegal (*Lamarck*); S. Africa (*Krauss*); Red Sea (*Brit. Mus.*); Aden (*Caramagna* under *M. variabilis*, Krauss).

240. Modiola auriculata, Krauss, var.?

Hab. S. and E. Africa; Gulf of Suez.

Two specimens, one of a bright red or almost scarlet colour, the other of the normal tint, are probably half-grown specimens of this species, differing from the typical form in having the dorsal angle more central and no emargination or sinus in front of it.

241. Septifer excisus, Wiegmann.

Hab. Madagascar, Mauritius, Mozambique, Mergui.

242. Arca navicularis, Bruguière.

Hab. Suez, China, Amboina, N. and N.E. Australia, Solomon Is. Two dead valves are all that were obtained.

[1] Ann. & Mag. N. H. 1886, vol. xviii. p. 99.

243. Arca imbricata, Bruguière.

Hab. West Indies, Fernando Noronha, S. Africa, Indian Ocean, N.E. and N. Australia.

With this species I unite *A. umbonata*, Lamk., *A. cunealis*, Reeve, *A. kraussi*, Philippi, and *A. americana*, d'Orbigny.

244. Arca (Barbatia) obliquata, Wood.

Hab. South Africa.

Reeve's *A. obliquata* has been shown by Philippi and Lischke to be distinct from Wood's species, and it has been renamed *A. decurvata* by the latter author. I am of opinion that it is the same as *A. sinensis* of Philippi.

245. Arca (Barbatia) lima, Reeve.

Hab. Philippine Islands, Cape York.

A. trapezina, Lamarck, as determined by Reeve, is probably a form of this species, which is extremely variable in outline, no two specimens being quite alike.

246. Arca (Acar) domingensis, Lamarck.

This species, as shown by Lischke, has a world-wide distribution. In addition to the synonymy quoted by that author (Jap. Meer. Conch. ii. p. 142), I may mention that *A. dubia* of Baird also belongs to this species.

247. Arca (Anadara) scapha, Chemnitz.

Hab. Philippines, Indian Ocean, Natal, Suez.

248. Arca (Anadara) antiquata, Linn.

Hab. Australia, Indian Ocean, Mozambique.

This species was described by Reeve under the name of *A. maculosa*, under the impression that the "spots" on the posterior side constituted a good specific character. On carefully examining his type I find that the so-called "spots" are merely pieces of epidermis left upon the ribs, all of which might be removed with the point of a knife. The name *maculosa* therefore being unsuitable, had better be cast aside; and as Hanley (Ipsa Linn. Conch. p. 93) declares that the *A. antiquata* of Linn. is the same as Reeve's species, we can apply that designation instead. It seems to me very probable that an extended series of specimens would show that this species and *A. scapha* should be united.

249. Arca (Anadara) erythræensis, Jonas.

Hab. Red Sea; Zanzibar (*Mus. Cuming*).

250. Arca (Anadara) holoserica, Reeve.

Hab. Philippines, Madagascar, Mauritius, East Africa.

According to Mörch, whose opinion has been followed by von Martens and Kobelt, this species is synonymous with *A. uropygomelana* of Bory de St. Vincent. All we know about that species is its name, printed *A. uropigimelana* in Encyclop. Méthod. Vers, plates vol. i. p. 156, and the figures on pl. 307. No description or locality is given in the work. As the identification of the species from the figure only is uncertain, I prefer to retain Reeve's name *holoserica*, the type of which is before me.

Young specimens are not nearly so much produced posteriorly as the adult form represented by Reeve's figure.

251. ARCA (ANADARA) CLATHRATA, Reeve.

Hab. Philippine Islands; Gulf of Suez (*Cooke*).

A single specimen from Aden, 43 millim. in length and 34 high, has three more ribs than the type figured by Reeve, and is not quite so long in proportion. Reeve describes the epidermis as "very finely bristly between the ribs." The shell figured, as is evident from the illustration, is entirely devoid of periostracum, and neither in two other specimens in Cuming's collection, nor in that from Aden, is it "*bristly*," but roughly laminated between the costæ.

252. ARCA (SCAPHARCA) RUFESCENS, Reeve.

Hab. ——?

With this species I unite *A. disparilis*, Reeve, which, according to Kobelt, occurs in China. The species is variable in form and the number of ribs. The type specimen, although not a very large shell, is evidently old and much thickened.

253. ARCA (TRISIS) SEMITORTA, Lamarck.

Hab. Philippines, N. Australia; Tasmania (*Lamk.*).

254. CUCULLÆA CONCAMERATA (Martini).

Hab. Indian Ocean (various parts), China.

255. PECTUNCULUS PECTUNCULUS (Linn.).

Arca pectunculus, Linn., part., Syst. Nat. ed. 10, p. 695; Lister, Hist. Conch. pl. 239. f. 73; Savigny, Descrip. Egypte, Atlas, pl. x. f. 2.

Pectunculus subauritus, Lamarck, part., Syst. Anim. p. 115.

Pectunculus pectiniformis, Lamk. part., Hist. Anim. s. Vert. ed. 2, vol. vi. p. 494.

Hab. Bengal (*Lister*). Suez Bay, Gulf of Akaba, Persian Gulf, and Madagascar (*Brit. Mus.*).

What I believe to be two distinct species of *Pectunculus* have been confused by Linné, Lamarck, and others. The figures cited above depict a form with the radiating costæ separated by grooves, well-defined and about half as broad as the ribs themselves. On the other hand, the rest of the figures quoted by Linné as illustrative of his *Arca pectunculus* (Gualtier, Test. pl. 72. f. H, and ? Argenville, Conch. t. 27. f. B) represent a species the ribs of which are separated by very narrow sulci. This same form is figured by Reeve (Conch. Icon. ff. 11 *a*, 11 *b*), Chemnitz (Conch.-Cab. vii. ff. 568–9), Crouch (Conch. pl. 8. f. 12), Knorr (Vergnügen, v. pl. xii. f. 4), Bruguière (Encycl. Méth. pl. 311. f. 5), and Bonanni (Mus. Kirch. ii. pl. xvii. f. 129). The last-mentioned figure was described by Gmelin under the name of *Cardium amboinense* (Syst. Nat. p. 3255). The specific name I propose to retain for this form, as it is older than either *P. subauritus* or *P. pectiniformis* of Lamarck. Martens quotes it from Mergui.

The external colouring of these two species is very similar, but there is a feature within the valves which, in addition to the broader sulci, seems to indicate that the species are distinct. I refer to the colouring of the margin of the hinge-plate below the teeth. This is almost invariably of a rich brown or reddish-brown colour. On the other hand, in *P. amboinensis*, the species with broad ribs and narrow sulci, this part apparently is never entirely coloured, but occasionally a small brown mark is observable at one or both sides.

In the series of specimens in the British Museum, the differences are quite noticeable and the two forms are readily separable.

256. Limopsis forskalii, A. Adams.

Hab. Japan.

The single valve described by Adams is small in comparison with some of the specimens obtained at Aden by Major Yerbury. The largest is 25 millim. long, 25½ from the umbones to the ventral margin, and 13½ through the valves. The epidermis which remains towards the outer margin is closely pilose and yellowish. The interior of the *dead* valve from Japan was described as pale red; in the Aden specimens it is rich brown, paler or even whitish at the circumference, and in the middle of the valves the rich brown colour is more or less clouded with a thin whitish callus, which, however, does not cover the muscular scars or the pallial line. Hinge-teeth about 28 in number.

257. Pinna bicolor, Chemnitz.

Hab. Red Sea (*Chemnitz*); Malacca (*Reeve*); Mergui (*Martens*).

Two valves from Aden exhibit the coloration described by Chemnitz; one specimen agrees with Reeve's figure (Conch. Icon. f. 17), and another example is almost entirely of a uniform whity-brown colour, with the elevated ridges towards the apex obscurely tinted olive-brown. The elevated scales upon the feeble ridges are few and far apart.

258. Pinna serra, Reeve.

Hab. Queensland.

259. Pinna rigida, Dillwyn?

Hab. West Indies. One valve only.

260. Malleus albus, Lamarck.

Hab. Philippine Islands.

261. Malleus (Malvufundus) regula, Forskål.

Hab. Red Sea; Aden (*Caramagna*); Philippine Islands and South Australia.

262. Crenatula picta (Gmelin).

Hab. Red Sea.

Two small specimens from Aden, as regards colour, seem to connect this species and *C. mytiloides*, Lamk. It is not at all improbable that *C. viridis*, Lamk., is merely another colour-variety.

263. Meleagrina margaritifera (Linn.).

Hab. Red Sea, Persian Gulf, Indian Ocean, Philippines, N.W. Australia. Aden (*Caramagna*).

264. Meleagrina fucata, Gould.

Hab. Ceylon, Japan; Gulf of Suez (*Cooke*).

265. Vulsella ~~vulsella (Linn.)~~. rugosa Lam.

Hab. Red Sea; Aden (*Caramagna*).

For remarks and synonymy, see A. H. Cooke (Ann. Mag. Nat. Hist. 1886, vol. xvii. p. 62).

266. Pecten senatorius, Gmelin.

Hab. Moluccas, Philippines, Red Sea, &c.

267. Pecten lividus, Lamarck.

Hab. Red Sea, Mauritius; Aden (*Caramagna*).

268. Pecten luculentus, Reeve, var.

Hab. North Australia.

Two specimens from Aden agree exactly with the type as regards form, but differ in colour. Besides the golden yellow tint and the dark spotting between the ribs mentioned by Reeve, the valves in the shell figured are ornamented with a sort of irregular subreticulation of white lines. The specimens from Aden are white or washed with pale rose and conspicuously spotted with black in the furrows between the principal nine or ten ribs, the dots forming an equal number of uninterrupted colour-rays. These examples also exhibit the irregular opaque white lines. The ribs are finely prickled and the surface is ornamented throughout with a microscopic sculpture.

269. Pecten plica, Linn.

Hab. China, Ceylon, Red Sea; Aden (*Caramagna*).

Two valves of a species of *Spondylus* (270), an *Anomia* (271), a *Plicatula* (272), and an Oyster (273) were also collected by Major Yerbury, but these I refrain from attempting to name, as they belong to genera requiring special study.

APPENDIX.

1. Species quoted by Signor Caramagna[1] which were not obtained by Major Yerbury or Mr. Baynham.

1. Rostellaria curta, *Sow.*
2. Murex tribulus, *Linn.*
3. Ranella spinosa, *Lam.*
4. —— crumena, *Lam.*
5. Fasciolaria filamentosa, *Lam.*
6. Cancellaria verreauxi, *Kiener.*
7. Pirula nodosa, *Lam.*
8. Eburna ceylanica, *Lam.*
9. —— spirata, *Lam.*
10. Nassa marginulata, *Lam.*
11. Ancillaria castanea, *Sow.*
12. —— albifasciata, *Swains.*
13. Conus achatinus, *Chemn.*
14. —— millepunctatus, *Lam.*
15. —— magus, *Lam.*
16. —— sulphuratus, *Kien.*
17. Marginella monilis, *Lam.*
18. —— faba, *Linn.*
19. —— lactea, *Kien.*
20. Turritella imbricata, *Lam.*
21. Trochus virgatus, *Gmel.*
22. Atys naucum, *Linn.*
23. Dolabella gigas, *Rang.*
24. Ostrea cornupina, *Lam.*
25. —— limacella, *Lam.*
26. —— crista-galli, *Linn.*
27. Pecten sanguinolentus, *Sow.*
28. —— sanguineus, *Linn.*
29. Meleagrina varia, *Dkr.*
30. Avicula macroptera, *Rve.*
31. —— cumingii, *Rve.*
32. Vulsella spongiarum, *Lam.*
33. Vulsella assabensis, *De Greg.*
34. —— pulchella, *De Greg.*
35. Perna femoralis, *Lam.*
36. Pinna rudis, *Linn.*
37. —— attenuata, *Rve.*
38. —— nigrina, *Linn.*
39. Arca retusa, *Lam.*
40. —— auriculata, *Chemn.*
41. —— tortuosa, *Linn.*
42. Cardium flavum, *Linn.*
43. —— pseudolima, *Lam.*
44. —— marmoreum, *Linn.*
45. Lucina tigerina, *Rve.*
46. Cardita variegata, *Linn.*
47. —— angisulcata, *Rve.*
48. Dosinia bilunulata, *Gray.*
49. Cytherea (Callista) guineensis, *Linn.*
50. —— (——) mactroides, *Lam.*
51. —— (——) triradiata, *Dillw.*
52. —— (——) inflata, *Desh.*
53. Tapes araneosus, *Phil.*
54. Tellina radiata, *Linn.*
55. —— fausta, *Pulteney.*
56. Psammobia elongata, *Desh.*
57. —— maxima, *Desh.*
58. Mesodesma striata, *Lam.*
59. Donax faba, *Chemn.*
60. Solen ceylanicus, *Leach.*
61. Cultellus cultellus, *Linn.*
62. Machæra radiata, *Linn.*
63. Corbula crassa, *Hinds.*

2. Species mentioned by Dr. Jousseaume, and not in the Yerbury and Baynham Collections.

1. Ianthina fragilis, *Linn.*
2. Vertagus vertagus, *Gmel.*
3. Conus fulvocinctus, *Crosse.*
4. —— tigrinus, *Sow.*
5. Tritonidea rufina, *Jouss.*
6. Odostomia fauroti, *Jouss.*
7. Cassis fauroti, *Jouss.*
8. —— torquata, *Rve.*
9. Pirula decussata, *Wood.*
10. Oliva bulbosa, *Bolten.*
11. Natica vestalis, *Phil.*
12. Clavagella adenensis, *Jouss.*
13. Siliqua polita, *Hanley.*
14. Cuspidaria adenensis, *Jouss.*
15. Tivela damaoides, *Gray.*
16. Petricola hemprichi, *Issel* (= P. lithophaga).
17. Scapharca natalensis, *Krauss.*
18. Trisis fauroti, *Jouss.*
19. Pinna penna, *Rve.*
20. Pecten splendidulus, *Sow.*

EXPLANATION OF PLATE XXXIII.

Fig. 1. *Conus adenensis*, p. 401.
2. *Pleurotoma (Drillia) baynhami*, p. 404.
3. *Columbella propinqua*, p. 405.

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[1] Some of these may be the same as those in the collection before me, but under different names.

Fig. 4. *Cerethium yerburyi*, p. 417.
5. *Strombus yerburyi*, p. 418.
6. *Chiton (Ischnochiton) yerburyi*, p. 420.
7. —— (*Callistochiton*) *adenensis*, p. 421.
8. *Tellina* (*Angulus?*) *adenensis*, p. 426.
9. —— (——) *subpallida*, p. 426.

4. Descriptions of new Species of Shells from the 'Challenger' Expedition. By Edgar A. Smith, F.Z.S.

[Received June 10, 1891.]

(Plates XXXIV. & XXXV.)

Together with the duplicates from the 'Challenger' collections, transferred last year from Edinburgh to the British Museum, were a number of specimens which had not as yet been examined. Among these five of the following new species from various localities were discovered. The remainder were all dredged off Sydney in 410 fathoms. At this station (164 B), in addition to the new species here described were a number of others, and amongst these several undoubtedly Atlantic forms. As Dr. Murray proposes to publish a special report upon the results obtained at this station, I refrain from further allusion to it.

1. Lampusia (Priene) murrayi. (Plate XXXIV. fig. 1.)

Testa fusiformis, albida, subtenuis, epidermide crassiuscula, luteo-cinerea, confertim pilosa induta; anfractus — ? (apice fracto), convexi, sutura profunda obliqua sejuncti, supremi fortiter cancellati, versus ultimum sensim læviores, varicibus duobus instructi, ultimus elongatus, antice breviter rostratus, spiraliter costulatus, costulis longitudinalibus obsoletis subcancellatus; apertura ovata, superne et inferne acuminata, intus sordide albida, cum canali longit. totius ½ adæquans; labrum expansum, album, extus incrassatum; columella leviter arcuata, callo nitido induta; canalis obliquus, profundus, recurvus.

Longit. 87 *millim., diam. maj.* 43; *apertura cum canali* 45 *longa*, 19 *lata*.

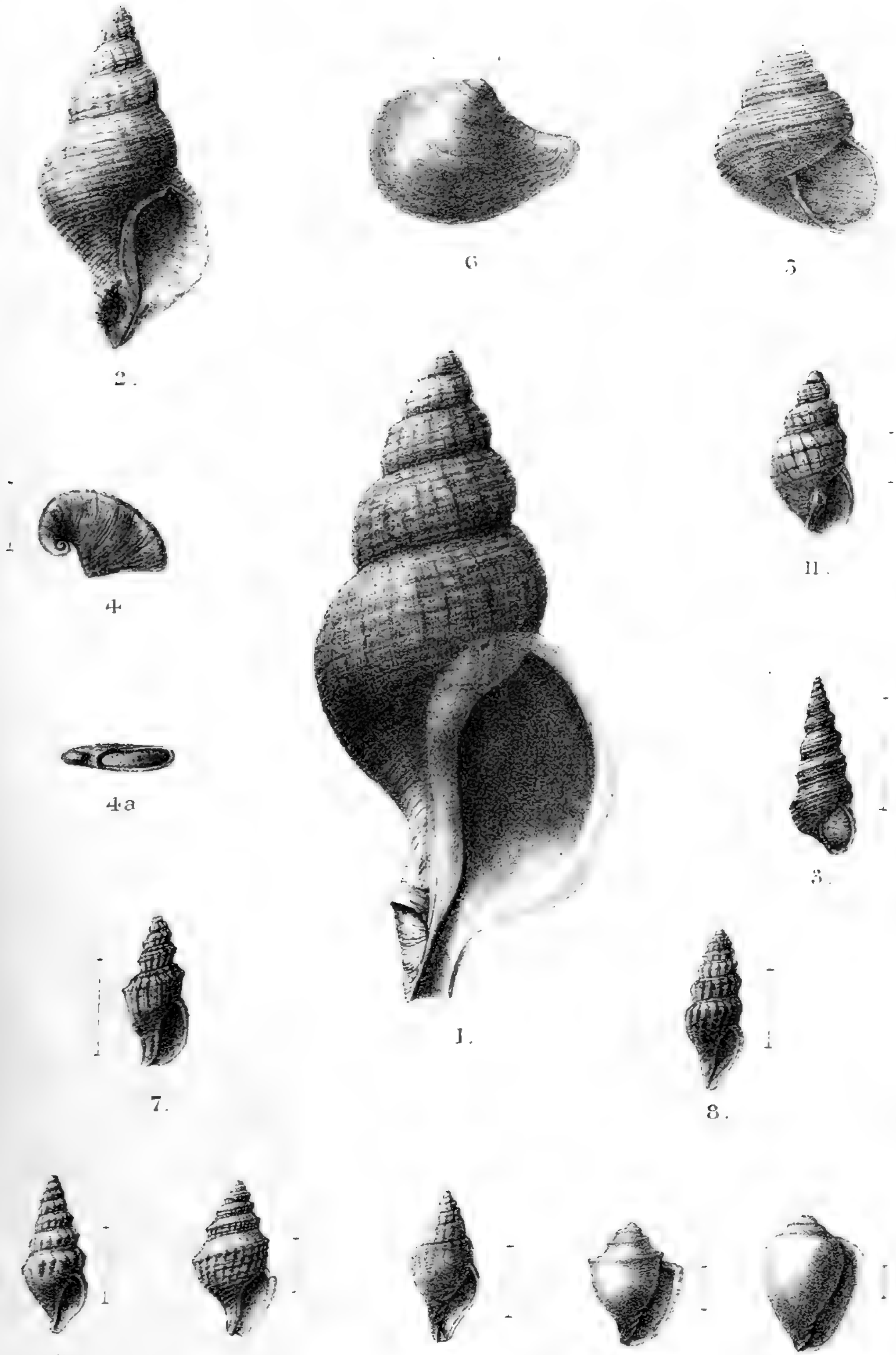
Hab. Station 142. Off the Cape of Good Hope, in 150 fathoms.

This species is much more slender than *Priene magellanicus* (Chemn.), Dillwyn, and has the spire longer in proportion to the aperture. The epidermis also is of a much closer texture and more finely pilose.

2. Coralliophila wahlbergi (Krauss). (Plate XXXIV. fig. 2.)

Purpura wahlbergi, Krauss, Südafr. Moll. p. 118, pl. vi. f. 15.

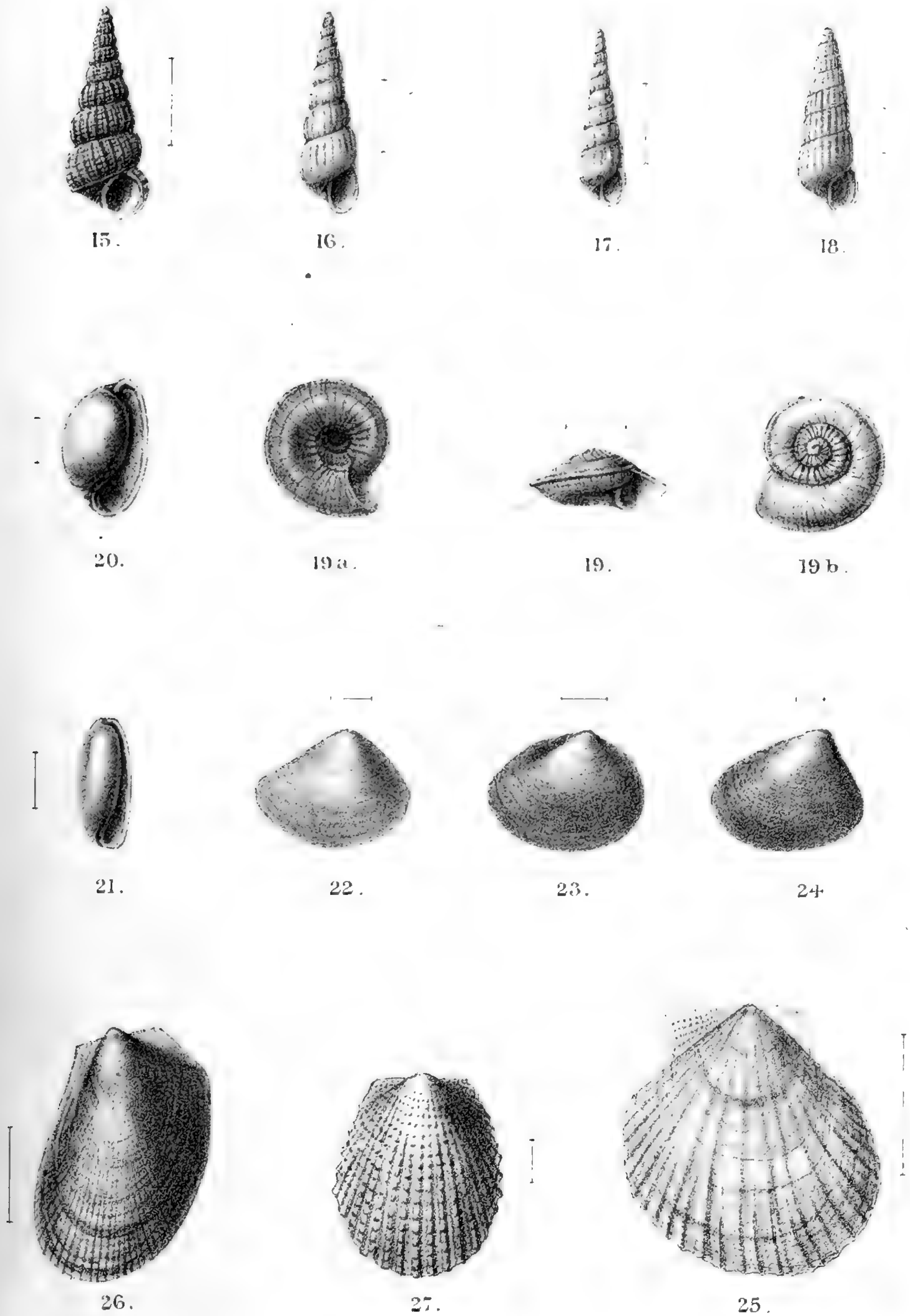
Testa breviter fusiformis, solida, alba, rimata; anfract. normales 6, *convexi, superne prope suturam leviter constricti, confertim spiraliter lirati (liris inæqualibus, incrementi*



R. Mintern del. et lith.

Mintern Bros. imp.

NEW SPECIES OF SHELLS FROM THE CHALLENGER EXPEDITION.



R. Mintern del et lith.

Mintern Bros. imp.

NEW SPECIES OF SHELLS FROM THE CHALLENGER EXPEDITION.

lineis crispatis), supremi oblique plicati (plicis in ultimo fere obsoletis); apertura elongato-ovata, alba, longitudinis totius $\frac{1}{3}$ *paulo superans; labrum incrassatum, intus liris circiter* 10 *munitum; columella leviter arcuata, callo valido, superne tuberculo parvo instructo, induta; canalis brevis, obliquus, recurvus, fere clausus.*

Longit. 41 *millim., diam.* 22; *apertura* 14 *longa,* 9 *lata.*

Hab. In shallow water near Sea Point, Cape of Good Hope; Natal (*Krauss*).

This is a strong, solid shell, entirely white within and without, and ornamented with numerous spiral ridges, which are somewhat regularly alternately larger and smaller, the intervening grooves being merely incised striæ. The outer lip is well thickened and armed within with about ten liræ, which, however, do not extend very far within the aperture.

It does not compare with any other species. In form it somewhat resembles *Euthria lineata* from New Zealand, but is altogether different in sculpture and the mouth characters. *E. magellani*, Vélain, has a somewhat similarly thickened labrum, but is altogether different in other respects.

3. Turritella incolor. (Plate XXXIV. fig. 3.)

Testa elongata, turrita, acuminata, alba; anfract. convexiusculi, carinis duobus mediocriter acutis circa medium instructi, liris paucis supra, inter, et infra carinas cincti, ultimus inferne liris concentricis paucis ornatus; apertura subrotundata; columella parum curvata, vix reflexa.

Longit. 14 *millim., diam.* 5; *apertura* $3\frac{1}{3}$ *longa,* $2\frac{1}{2}$ *lata.*

Hab. Royal Sound, Kerguelen Island, 28 fathoms.

The two keels stand out conspicuous, and there is a finer liration above them, one between the two keels and one below them. The single specimen consists of about ten whorls. It is less slenderly tapering than *T. hookeri*, Reeve, which, besides the two prominent spiral keels, exhibits only the faintest trace of spiral striæ.

4. Capulus compressus. (Plate XXXIV. figs. 4, 4 *a*.)

Testa dextrorsa, alta, pileiformis, lateraliter compressa, planata, tenuis, alba, epidermide decidua flavescente induta, lineis incrementi subfortiter striata; anfractus 2–3, celeriter crescentes, duo supremi parvi, vitrei, regulares, convexiusculi, nitentes, ultimus maximus subunguiformis, supra et infra planatus; apertura oblonga, angusta.

Diam. maj. $8\frac{1}{2}$ *millim., alt.* $2\frac{1}{2}$; *apertura* 5 *longa,* 2 *lata.*

Hab. Station 311. Off west coast of South Patagonia in 245 fathoms.

No described species appears to approach that now before us. Judging from its compressed character it is probably either parasitic upon something with thin filaments or stems (the cirri or rays of a crinoid for example), or it would be found attached to the stems of seaweed.

5. Trochus (Bembix) abyssorum. (Plate XXXIV. fig. 5.)

Testa imperforata, turbinata, subtenuis, sordide albida, nitida; anfract.—?, convexi, liris spiralibus inæqualibus (in penult. 7), lineis incrementi validis obliquis confertis supra liras subnodulosis cancellati, ultimus magnus, subinflatus, liris circiter 20 cinctus; apertura magna leviter obliqua, longitudinis totius ½ haud æquans, intus tenuiter sulcata, magaritacea; labrum tenue, anguste expansum; columella obliqua, vix curvata, subreflexa.

Longit. 26 *millim., diam. maj.* 20; *apertura* 11 *longa*, 11 *lata.*

Hab. Station 241. North Pacific, east of Japan, in 2300 fathoms.

The single specimen consists of four whorls only. The apex appears to have been broken off rather abruptly. The oblique lines of growth are strongly developed, taking the form of raised liræ; they cross the spiral ridges, which in consequence have a finely subgranose appearance. The interior of the aperture is thinly nacreous, and the sulci within correspond with the external liræ.

6. Cuspidaria (Myonera) lischkei. (Plate XXXIV. fig. 6.)

Testa parva, tenuis, globosa, postice breviter rostrata, æquivalvis, concentrice tenuiter striata, striis supra rostrum paulo validioribus; margo dorsi anticus leviter convexus, posticus declivis, incurvatus, ventralis late curvatus, prope rostrum levissime sinuatus; latus anticum magnum, curvatum, posticum angustatum, rostratum, ad extremitatem breviter truncatum, carina obsoleta ab umbone radiante instructum; umbones parvi, subcentrales; linea cardinis edentula tenuis, in valva sinistra pone umbonem leviter incrassatum; ligamentum parvum.

Longit. 8 *millim., alt.* 5½, *diam.* 4.

Hab. Station 237. South of Japan, in 1875 fathoms.

This species is remarkable for the obtuseness of the anterior outline. It somewhat resembles *C. teres*, Jeffreys, but is more obtuse in front, and also differs in sculpture and the hinge-characters.

(*Descriptions of new Species of Shells from Station* 164 B.)

7. Pleurotoma (Drillia) challengeri. (Plate XXXIV. fig. 7.)

Testa parva, alba, angusta, breviter fusiformis; anfractus 7, duo supremi (nucleus) læves, convexi, cæteri superne excavati, infra leviter convexi, costis tenuibus (in anfr. penult. circiter 16) et liris spiralibus minus conspicuis (infra suturam quoque ad angulum supra costas tuberculatis) instructi; anfr. ultimus elongatus, costis inferne sensim obsoletis; apertura angusta, longit. totius ½ haud æquans; labrum tenue, in concavitate haud profunde sinuatum.

Longit. 12 *millim., diam.* 4; *apertura* 5½ *longa*, 2 *lata.*

This species has a large apex, a shallow labral sinus, and the whorls with a double coronation around the upper part.

8. Pleurotoma (Drillia) crossei. (Plate XXXIV. fig. 8.)

Testa parva, breviter fusiformis, albida; anfract. 7, supremus lævis, convexus, cæteri superne leviter concavi, rotunde angulati, infra angulum arcuatim contracti, costis obliquis tenuibus circiter 15 (*in anfr. ult. inferne attenuatis*) *instructi, lineisque elevatis paucis parum conspicuis infra angulum ornati; anfr. ult. inferne valde contractus; apertura parva, longit. totius* $\frac{2}{5}$ *adæquans; labrum supra angulum haud profunde sinuatum.*

Longit. 10 *millim., diam.* $3\frac{3}{4}$; *apertura* 4 *longa*, 2 *lata.*

This species has the whorls much contracted at the lower part and prominent at the rounded angle. The riblets are oblique below, and flexuous in the concavity. The spiral liræ are more conspicuous around the lower part of the body-whorl than elsewhere, and altogether absent in the concavity below the sutural line.

9. Pleurotoma (Drillia) hoylei. (Plate XXXIV. fig. 9.)

Testa parva, breviter fusiformis, albida; anfract. 8, *superne oblique concavi, in medio obtuse angulati, infra angulum contracti, vix convexiusculi, costis oblique flexuosis, præcipue ad angulum (supra et infra mox evanidis) instructi, striisque incrementi tenuissimis sculpti; apertura parva, longit. totius* $\frac{1}{3}$ *paulo superans; sinus labri mediocriter profundus, in concavitate situs.*

Longit. 9 *millim., diam.* $3\frac{1}{2}$; *apertura* $3\frac{1}{2}$ *longa*, $1\frac{1}{2}$ *lata.*

The costæ in this species are very short, and soon become obsolete above and below the angle, so that they appear like a series of oblique nodules. The absence of spiral sculpture is peculiar.

10. Pleurotoma (Drillia) watsoni. (Plate XXXIV. fig. 10.)

Testa parva, breviter fusiformis, alba; anfr. 6, *supremi duo (nucleus) læves, convexi, cæteri superne oblique declives, dein angulati, infra angulum plani, costis tenuissimis obliquis circiter* 20 *lirisque spiralibus (in anfr. superioribus duo, in ultimo circiter* 14) *nodose cancellati, supra angulum liris spiralibus paucis subobsoletis cincti; anfr. ult. infra medium valde contractus; sinus mediocriter profundus; labrum arcuatum, prominens.*

Longit. $6\frac{2}{3}$ *millim., diam.* $3\frac{1}{3}$; *apertura* $2\frac{3}{4}$ *longa*, $1\frac{1}{3}$ *lata.*

This shell has a large smooth apex; the upper slope of the whorls is comparatively smooth, exhibiting only a few (about 4) faint spiral liræ, and the lower portion and the greater part of the body-whorl are covered with a distinct cancellation, the points of intersection of the oblique and transverse liræ being rather acutely nodulose.

11. Cancellaria exigua. (Plate XXXIV. fig. 11.)

Testa minima, elongata, ovata, alba; anfract. 4–5, *supremus (nucleus) magnus, lævis, globosus, cæteri convexi, circa medium liris duobus spiralibus cincti, costis obliquis tenuibus circiter* 12 *cancellati; anfr. ultimus lira spirali tertia paulo infra medium ornatus; apertura parva, longit. totius $\frac{5}{12}$ adæquans; columella in medio uniplicata, antice subsinuata.*

Longit. 6 *millim., diam.* 3; *apertura* $2\frac{1}{2}$ *longa,* $1\frac{1}{2}$ *lata.*

In size and form *C. fischeri* of A. Adams, from the Straits of Korea, bears considerable resemblance to the present species. It has, however, more spiral liræ, three columellar plaits and liræ within the aperture, a feature which does not appear in the *single* shell at hand from station 164, but which possibly might be detected in a larger series of specimens.

12. Mitra miranda. (Plate XXXIV. fig. 12.)

Testa fusiformis, turrita, albida; anfract. 7, *apicalis lævis, globosus, cæteri superne anguste tabulati, ad latera vix convexiusculi, costis crassis (in anfr. ult. plus minus obsoletis) circiter* 15 *instructi, linea impressa spirali infra suturam sculpti, ultimus infra medium constrictus, antice sulcis paucis circa caudam sculptus; apertura elongata, longit. totius $\frac{1}{2}$ æquans vel superans; columella plicis quatuor tenuibus distantibus instructa.*

Longit. 9 *millim., diam.* 4; *apertura* $4\frac{2}{3}$ *longa,* $1\frac{1}{2}$ *lata.*

The folds on the columella are very peculiar, and recall those in certain species of *Voluta*; they are rather far apart, and do not all slope in the same direction. The spiral sulcus falls below the edge of the tabulation, producing a kind of thickened edge to it.

13. Marginella carinata. (Plate XXXIV. fig. 13.)

Testa breviter ovato-fusiformis, alba, polita, lævis; anfract. 5, *supremus convexus, sequentes superne valde excavati, dein acute angulati, ultimus infra angulum leviter convexus, basim versus contractus; apertura elongata, angusta, longit. totius $\frac{7}{11}$ adæquans; labrum valde incrassatum, intus læve; columella plicis tribus, tenuibus sed prominentibus, instructa, antice oblique curvata, per longitudinem callo tenui induta.*

Longit. $5\frac{1}{4}$ *millim., diam.* $3\frac{2}{3}$; *apertura* $3\frac{2}{3}$ *longa,* 1 *lata.*

The whorls are well excavated at the upper part and then rather sharply keeled a little above the suture. The surface is very glossy, and the columellar folds are subequal and thin but prominent.

14. Marginella brazieri. (Plate XXXIV. fig. 14.)

Testa parva, brevis, lata, alba, polita, subpellucida; spira brevissima, ad apicem obtusa; anfractus 4, *prope suturam depressi, leviter marginati, ultimus magnus, superne late rotundeque humerosus, inferne angustus, contractus; apertura mediocriter angusta, circa $\frac{5}{6}$ longit. totius occupans; columella plicis tribus tenuibus instructa; labrum extus incrassatum, intus læve.*

Longit. 4 *millim., diam.* 3; *apertura* $3\frac{1}{3}$ *longa,* 1 *lata.*

This and *M. carinata* have three columellar folds in addition to the oblique anterior termination of the columella which passes into the labrum.

15. Scalaria distincta. (Plate XXXV. fig. 15.)

Testa elongata, gracilis, alba; anfractus perconvexi, lente accrescentes, costis tenuibus circiter 16 (*hic illic una crassiore*) *paulo obliquis instructi, liris spiralibus tenuioribus circa* 5 *supra costas continuis ornati; anfr. ultimus medio carinatus, infra concavus, sublævis; apertura subcircularis.*

Longit. 11 *millim., diam.* $3\frac{1}{2}$; *apertura* $2\frac{1}{2}$ *longa et lata.*

The larger costæ are about twice as thick as the rest, and one in number on every whorl.

16. Odostomia (Turbonilla) fischeri. (Plate XXXV. fig. 16.)

Testa gracilis, subulata, alba, polita; anfractus normales 9, *convexi, lente crescentes, sutura subprofunda sejuncti, longitudinaliter confertim plicati, plicis in anfr. ultimo infra medium obsoletis; apex sinistrorsus, globosus, heliciformis; apertura parva, longit. totius* $\frac{2}{9}$ *adæquans; columella subperpendicularis, vix arcuata, anguste reflexa, haud plicata vel contorta.*

Longit. 9 *millim., lat.* $2\frac{1}{2}$; *apertura* 2 *longa,* $1\frac{1}{3}$ *lata.*

Of the two specimens under examination, one has the costæ rather more decidedly developed than the other. The latter exhibits slight traces of spiral striæ below the suture.

17. Odostomia (Turbonilla) consanguinea. (Plate XXXV. fig. 17.)

Testa O. fischeri *similis, sed gracilior, anfractibus normalibus* 11 *constructa, costis latioribus* 14–15 *parum elevatis ornata; apertura parva, longit. totius* $\frac{1}{6}$–$\frac{1}{7}$ *adæquans.*

Longit. 10 *millim., diam.* 2; *apertura fere* $1\frac{1}{2}$ *longa,* 1 *lata.*

The ribs or plicæ in *O. fischeri* are about seventeen or eighteen in number and considerably finer than in the present species. Besides this distinction, the proportions with regard to length are so different that there is little doubt that they constitute separate species.

18. Odostomia (Turbonilla) constricta. (Plate XXXV. fig. 18.)

Testa elongata, parum pyramidalis, alba, nitida; anfractus normales octo, subplani, sed in medio leviter constricti, sutura lineari, distincta sejuncti, costis rectis 16–17 *interstitia subæquantibus, instructi, anfr. ultimus inferne lævis, ad peripheriam rotundatus; apex globosus, sinistrorsus, lævis; apertura plus minus subquadrata, longit. totius* $\frac{1}{5}$ *subæquans; columella leviter obliqua, haud torta.*

Longit. $5\frac{1}{2}$ *millim., diam.* $1\frac{2}{3}$; *apertura* 1 *longa,* $\frac{2}{3}$ *lata.*

The constriction is just a trifle above the middle of the whorls, which have a slightly turreted appearance.

19. Solarium atkinsoni. (Plate XXXV. figs. 19–19 *b*.)

Testa discoidalis, acute carinata, mediocriter umbilicata, albida, superne depresse conoidalis, lateribus leviter convexis, infra *carinam æqualiter convexa; anfractus normales 3, ad suturam carina marginati, radiatim tenuiter plicati (plicis supra anfr. ultimum fere obsoletis), liris duabus (altera supra, altera suturam infra) plus minus indistinctis supra plicas leviter nodulosis cincti; anfr. ultimus prope umbilicum radiatim plicatus, peripheriam versus concentrice subliratus; umbilicus carina intrante crenulata marginatus; apertura rotunde subtriangularis.*

Diam. maj. $7\frac{1}{2}$ millim., min. $6\frac{1}{2}$; alt. 4; umbilicus 2 latus.

This species somewhat resembles *S. discus* of Philippi as regards general form, but it appears to be more acutely carinate, and there are differences in the aperture.

The apex consists of about one and a half smooth convex whorls which are incoiled and thus conceal the nucleus.

20. Bulla incommoda. (Plate XXXV. fig. 20.)

Testa parva, anguste umbilicata, ovata, alba, nitida, superne et inferne striis transversis paucis sculpta, incrementi lineis striata; apex angustissime perforatus; apertura angusta, infra paulo dilatata, superne supra apicem producta; columella leviter torta, inferne arcuata, reflexa, expansa.

Longit. $5\frac{1}{3}$ millim., diam. maj. $3\frac{1}{2}$, min. 3.

The few spiral striæ at each end are rather far apart, with the exception of those immediately around the umbilicus, which are more approximated.

21. Cylichna ordinaria. (Plate XXXV. fig. 21.)

Testa cylindracea, alba, nitida, imperforata, ad apicem haud profunde excavata, impressione carina circumdata; apertura angustissima, antice dilatata, subtruncata; columella subtorta, excavata, carina circumcincta.

Longit. 7 millim., diam. 3.

The distinguishing feature of this species is the excavation of the lower part of the columella, which is circumscribed by a keel, a continuation of the thin outer lip.

22. Tellimya subacuminata. (Plate XXXV. fig. 22.)

Testa M. acuminatæ *similis, sed postice minus rostrata, margine inferiore latius curvato, postico dorsali declivi, fere rectilineari.*

Longit. 5 millim., alt. 4, diam. $2\frac{3}{4}$.

This species closely resembles *Montacuta acuminata*, Smith, from North Australia, but differs in form somewhat. It is longer in proportion to the height, has the ventral outline more gently curved, the posterior end is not so beaked, and the dorsal slopes, especially the posterior one, are more rectilinear. The sculpture and dentition are similar.

23. Nucula dilecta. (Plate XXXV. fig. 23.)

Testa parva, inæquilateralis, ovata, utrinque subæqualis, nitida, incrementi lineis tenuibus striata, dilute virenti-lutea, umbones versus pallidior, induta; apices opaci, albi, antemediani, ad $\frac{1}{3}$

longitudinis siti, mediocriter acuti ; lunula elongata, lanceolata, in medio prominens, porca distincta circumdata ; area dorsi postica haud definita, in medio prominens ; linea cardinis mediocriter valida, dentibus novenis posterioribus septemque anterioribus acutis instructa. Fossa ligamenti parva, profunda, postice obliqua ; pagina interna albo-margaritacea, radiatim minute substriata, margine simplice circumdata.

Longit. $5\frac{1}{2}$ *millim., alt.* $4\frac{1}{3}$, *diam.* 3.

24. Nucula umbonata. (Plate XXXV. fig. 24.)

Testa parva, inæquilateralis, trigono-ovata, nitida, epidermide dilute lutescente induta, apicem versus pallidior, incrementi lineis striisque radiantibus tenuissimis sculpta ; margo dorsi utrinque valde declivis, parum arcuatus, ventris late curvatus ; latus anticum ad extremitatem subangulatum, posticum acute curvatum ; umbones prominentes, pallidi, ante medium collocati ; linea cardinis valida, dentibus anterioribus series novemque posterioribus instructa. Margo valvarum inferior intus minute denticulatus.

Longit. $3\frac{1}{3}$ *millim., alt.* 3, *diam.* 2.

This species is peculiar for its somewhat triangular form, prominent umbones, the fine radiating striæ, and the denticulated inner margin of the valves. The lunule is not clearly defined, but the posterior dorsal area is narrow and bounded by a slight but distinct ridge.

25. Pecten challengeri. (Plate XXXV. fig 25.)

Testa tenuis, subpellucida, æquivalvis, paulo obliqua ; valvæ costis tenuibus subdistantibus plicisque concentricis paucis subcancellatæ, undique minute radiatim microscopice striatæ ; costæ tenues, interdum pallide lutescentes, margines versus plus minus minute squamatæ ; auriculæ valvæ sinistræ inæquales, antica majori ; postica valvæ dextræ liris sex confertim squamatis instructa, inferne mediocriter profunde sinuata ; pagina interna nitens, radiatim haud profunde sulcata, sulcis liris externis congruentibus.

Longit. 18 *millim., alt.* 19, *diam.* $4\frac{1}{2}$.

Of this pretty species there is one perfect specimen and a single right valve. The substance of the shell is very thin, semipellucid towards the umbones, and rather more opaque elsewhere. The radiating striæ are excessively minute, and a trifle more conspicuous in the right valve than in the left. The valves are decidedly oblique towards the front and smooth at the apices, the costæ commencing at a distance of about two millimetres from the extreme tip. Most of the ridges in the left valve have a pale luteous tint upon their lower halves, a feature not present in the other valve of the same specimen, which, however, is peculiar in having a bright reddish streak on the dorsal slopes within.

The few concentric plicæ which produce the somewhat cancellated aspect of the exterior appear to be periodic marks of growth.

26. Lima murrayi. (Plate XXXV. fig. 26.)

Testa tenuissima, oblonga, obliqua, haud hians, liris tenuissimis numerosis radiantibus, lineisque incrementi minutis (hic illic paucis majoribus) instructa ; latus posticum obliquum fere rectilineare, anticum superne leviter incurvatum, deinde prominens, excurvatum, inferne oblique recedens ; margo dorsi brevis, ventris regulariter curvatus ; area dorsali parva, plana, fossa ligamentali magna profunda sculpta ; apices valvarum peculiares, gibbosi, parvi ; pagina interna subnitida, radiatim subsulcata, ad marginem crenulata, lira tenui ab apice usque ad partem prominentem lateris antici extendente instructa.

Longit. 8 *millim., alt.* 12, *diam.* 6.

This species is remarkable for its thinness of texture, the peculiar bulging form of the anterior side, more marked than in *L. loscombii,* and the fine radiating liræ. Between these there are still finer hair-like threads, which being crossed by the lines of growth are more or less *minutely* granular. The hinge-line is short, thin, and concave in the centre at the ligamental depression. On each side at the top of the lateral margins there are two or three short oblique liræ or pseudo-teeth. The margin of the valves is distinctly dentate within, as in most species of *Pecten.* I have named this after Dr. John Murray, the learned and energetic editor of the ' Challenger ' Reports.

27. Lima australis. (Plate XXXV. fig. 27.)

Testa parva, altior quam longa, ovata, superne truncata, æquilateralis, mediocriter convexa, alba, costis tenuibus radiantibus (circiter 20), *pulcherrime squamo-nodosis, instructa, lineis incrementi in interstitiis conspicuis subcancellata ; area ligamenti angusta, plana, fossa triangulari in utraque valva insculpta ; linea cardinis subvalida, transversim confertim sulcata et lirata ; pagina interna alba, radiatim sulcata, ad marginem latum dentata.*

Longit. 4 *millim., alt.* 5, *diam.* 3.

This is a larger species than *L. pectinata,* H. Adams, from the Gulf of Suez, and has more slender and differently sculptured ribs ; these are considerably narrower than the interstices. Both these species have the hinge-line much thicker than in the European *L. sarsii,* and the transverse toothing more distinct.

EXPLANATION OF THE PLATES.

Plate XXXIV.

Fig. 1. *Lampusia (Priene) murrayi,* p. 436.
2. *Coralliophila wahlbergi,* p. 436.
3. *Turritella incolor,* p. 437.
4, 4 *a. Capulus compressus,* p. 437.
5. *Trochus (Bembix) abyssorum,* p. 438.
6. *Cuspidaria (Myonera) lischkei,* p. 438.
7. *Pleurotoma (Drillia) challengeri,* p. 438.
8. —— (——) *crossei,* p. 439.
9. —— (——) *hoylei,* p. 439.
10. —— (——) *watsoni,* p. 439.

Fig. 11. *Cancellaria exigua*, p. 439.
12. *Mitra miranda*, p. 440.
13. *Marginella carinata*, p. 440.
14. —— *brazieri*, p. 440.

PLATE XXXV.

Fig. 15. *Scalaria distincta*, p. 441.
16. *Odostomia* (*Turbonilla*) *fischeri*, p. 441.
17. —— (——) *consanguinea*, p. 441.
18. —— (——) *constricta*, p. 441.
19–19 *b*. *Solarium atkinsoni*, p. 441.
20. *Bulla incommoda*, p. 442.
21. *Cylichna ordinaria*, p. 442.
22. *Tellimya subacuminata*, p. 442.
23. *Nucula dilecta*, p. 442.
24. —— *umbonata*, p. 443.
25. *Pecten challengeri*, p. 443.
26. *Lima murrayi*, p. 444.
27. *Lima australis*, p. 444.

5. On the present Distribution of the Giraffe, South of the Zambesi, and on the best means of securing living Specimens for European Collections. By H. A. Bryden.

[Received June 15, 1891.]

Large game animals are disappearing so rapidly from Southern Africa that each year now sees the ancient limits of occurrence more and more circumscribed.

Guns are now plentiful among native tribes, right away to the Zambesi, and, with the rapid advent of Europeans and European money into once remote territories, horses, on which depends the successful chase of many of the fauna, are now more readily procured.

In twenty years' time it may be safely said there will be very few Giraffes left, even in the inaccessible deserts where they yet seclude themselves. With the practical disappearance of the Rhinoceros from South Africa, and the approaching extinction of the Hippopotamus, the thick-skinned Giraffe is now much more sought after as a means of supplying the universally used sjambok or colonial whip. The hide of a good bull Giraffe is worth now from £4 to £5 for this purpose, that of a cow a little less. Small wonder then that native and Dutch hunters alike have been extremely active of late years in hunting this interesting, beautiful, and defenceless creature.

At the present day the head-quarters of the Giraffe may be said to be in the parched desert country comprising the North Kalahari.

A few years since they were to be found at no great distance from Khama's old capital, Shoshong; now they are first encountered in the bush and forest-region beyond Kanne, or Klaballa, on the way from Shoshong to Lake Ngami. This waterless tract, well called thirst-land, serves them as a safe retreat. From Kanne to the Botletli River, and thence halfway to the lake, Khama reserves them for his own and his people's hunting, and Dutch hunters, with their wasteful methods, are not permitted—a very wise precaution.

In most of Khama's country stretching north to the Victoria Falls, and west to the Chobe and Mababé Rivers and beyond, Giraffes may yet be found, as well as in Moremi's country, in the region of Lake Ngami.

Probably the pick of the Giraffe-country now left to South Africa is the desolate and quite waterless forest-region lying south of the Botletli River, and thence extending southward some way into the Kalahari.

For eight months of the year most of this "veldt" is quite waterless and cannot be hunted, unless water-carts could be taken in; here very large troops of the Giraffe roam free and undisturbed.

I have been told by reliable witnesses of 70 or 80 being seen together at one time in quite recent years. I myself, when hunting along the Botletli last year, within a day's ride of the river, met with a troop of nineteen, and smaller troops were also seen.

Khama's hunters make an annual excursion to this "veldt," and the average bag of each hunting outfit seems to be from 12 to 16 or 20 Giraffes. These are shot solely for the marketable value of their skins. All the natives in this part of Africa use the hide of the Giraffe for making their sandals.

From the Botletli Giraffes are found some way south into the Kalahari. Last year a troop or two must have wandered much farther down than usual, as, when near Honing Vley, in British Bechuanaland, I heard of Bareeki's hunters suddenly flocking into the Central Kalahari, Giraffes having penetrated nearly as far south as the Molopo River; this, however, is very unusual now-a-days. Westward of Tunobis (Galton's farthest point in 1850) towards Damaraland, Giraffes are not now found, the Namaqua hunters being too active in this region; but in parts of Ovampoland, towards the Okavango River, they are, I am informed, yet found in fair numbers. More to the eastward, on the south bank of the Chobe, they are also numerous.

Mr. Selous tells us that in parts of the Matabele country the Giraffe was common ten years since, and it is still to be found there, albeit in decreasing numbers. In Mashunaland proper it is scarce, and east of the Gwelo River, according to the same great hunter, it scarcely ever wanders. This is a rather singular fact, one of the often incomprehensible facts of geographical distribution.

Until a few years back Giraffes were to be found in the low country between the north-east border of the Transvaal and the sea; Boer hunters have, however, so persecuted the game in this region that very few can now be left. In the Transvaal itself I doubt if a single Giraffe is now to be found, even in the remote north-east district near the Limpopo River.

So far as one may judge the Camelopard will linger the longest in the inaccessible and waterless forests south of the Botletli River. This animal is very singularly independent of water; the Bushmen and others will tell you that it does not drink. This I do not believe, but it is certain that for seven or eight months of the year the Giraffes of the North Kalahari and other waterless regions can never touch water.

As to procuring living specimens :—

The Chief Khama of Bamangwato is (I speak from personal experience) so enlightened, so obliging, and so disposed to assist Europeans, and especially English people, in every possible way, that I am quite certain arrangements might be made with him for obtaining living specimens of the young of the Giraffe. Much of Khama's territory is the stronghold of this rare and singular creature, and in all his country the chief has implicit obedience from his vassals and tributaries. The Masarwa Bushmen of the North Kalahari and Botletli River regions, assisted by Khama's own mounted hunters, could spoor and catch the young of Giraffe, which could then be brought to Khama's town of Palachwe. From Palachwe to Vryburg, British Bechuanaland (420 miles), is but 20 days' journey, even by the slow-moving ox-waggon. From Vryburg to Cape Town the journey now occupies by rail two days and nights only. I know of no other part of Africa more accessible for the purpose I speak of, certainly no other where the willing services of an all-powerful chief such as Khama could be enlisted. In North Africa Giraffes have now very far to be sought, farther, I should say, even than in Khama's country. In East Africa the co-operation of native chiefs and hunters would be very hard to secure.

After Khama's time, the Giraffe, which he now to some extent preserves, will shortly be exterminated, and it will then be too late. I urge therefore upon all European collectors not to let slip the opportunity I have indicated.

6. Notes on some Reptiles from Trinidad.

By R. R. Mole and F. W. Urich[1].

[Received May 29, 1891.]

1. THE TREE-BOA (*Xiphosoma hortulanum*).

This Snake is comparatively common in Trinidad, principally in the locality of streams. Locally it is known as the "Cascabel Dormillon," which means "sleeping Rattlesnake." It is invariably found in the daytime rolled up in loose folds among the twigs of a tree the branches of which overhang a stream. When disturbed it does not, as a rule, try to escape, but launches out at the aggressor with widely distended jaws. At night these Snakes are lively and glide from bough to bough in search of small birds, squirrels, and porcupine-rats, which constitute their principal food.

The female of a pair of these Cascabels, caught by Mr. G. R.

[1] Received from Messrs. Mole and Urich along with living specimens of the Reptiles noticed. The scientific names have been kindly determined by Mr. G. A. Boulenger.—P. L. S.

O'Reilly in February 1890, in the act of copulating, and kept in his collection, gave birth to a large litter of young ones, between 20 or 30, in the following August. The young Cascabels, which are very small and thin with enormous heads, immediately display all the habits of the adult snake, coiling in the branches and being ever ready to bite fiercely. They feed upon lizards and mice, which they kill by constriction. We have noticed they hold their prey a long time after its death, and that after swallowing one victim they will not feed again until it is thoroughly digested, a habit in which they differ from other snakes of the Boa family, especially from *Epicrates cenchris* and *Boa constrictor*.

2. THE TIGRE SNAKE (*Spilotes variabilis*).

This large black Snake with pale yellow markings is known in Trinidad as the Tigre or Tiger. It has the reputation of being very fierce, but our experience, as gained by this specimen, is the reverse, as it permits itself to be handled with impunity. The Tigres are difficult to feed, but this one may be induced to eat young birds and young rats. It is very rapid in its movements, and is found in trees as well as on the ground. There is a larger variety entirely black, which is known as "the widow." The Tigres and Machetes, with many other colubrine snakes in Trinidad, have a very curious habit of agitating the tail with great rapidity when excited, producing a sharp tapping sound as if imitating the Mapepi (*Lachesis mutus*) and Rattlesnake.

3. THE MACHETE SNAKE (*Herpetodryas carinatus*).

This bright gold and bronze green Snake is known in Trinidad as the Machete or Macheta, because the male's back being ridged is thought to bear some resemblance to a machete or cutlass. It is an exceedingly swift snake, and is found in all kinds of situations, but chiefly on trees. It swims well. This specimen was first seen hanging by its tail from the topmost branch of a bush on a river-bank. When in captivity they are fond of climbing and resting on a large branch. This specimen laid five eggs, each about two inches long and as thick as the little finger. The Machete bites furiously when caught. It feeds on frogs principally, but will also eat young birds and lizards. There are several varieties in Trinidad, one of a beautiful green, but it is rarer than this kind.

4. THE PLICA LIZARD (*Uraniscodon plica*).

These Lizards, for which we have not found a generally accepted Creole name, have a very curious appearance. They are essentially tree- and wall-lizards, and apparently never seek the earth unless forced to do so. When they are chased and fall by accident to the ground, they are awkward and evidently unused to such a situation and are easily caught. They are found in colonies of six, eight, or even a dozen individuals on the trunks (rarely the branches) of large trees and on the rough stone walls of bridges, ruins and old houses, usually head downwards, but in whatever position they may be the head and fore part of the body is raised. They scramble about very quickly, but like all lizards soon exhaust themselves and can then be easily taken. They permit persons to approach near to them when first discovered, but soon become alarmed. When on trees, like squirrels and woodpeckers, they have a habit of placing themselves on the opposite side to the one in view. They live on spiders, beetles, and caterpillars, and in captivity eat cockroaches with avidity, managing sometimes to swallow very large ones. In confinement they have laid cylindrical-shaped eggs an inch long, covered with tough, white, slightly ribbed, parchment-like skin.

7. Additional Notes upon *Hapalemur griseus*. By Frank E. Beddard, M.A., Prosector to the Society.

[Received June 15, 1891.]

In the 'Proceedings' of this Society for 1884 (p. 391 *et seqq.*) I published a few notes upon the external characters and visceral anatomy of *Hapalemur griseus*. Since that date I have had the opportunity of dissecting two other examples of this Lemur, and am able to supplement my former paper with some account of the brain and the muscular system. Unfortunately both these individuals were, like the one which I first dissected, males. It is very desirable that the condition of the patch of modified integument upon the arms, so characteristic a feature of this animal, should be figured in the female. It was first figured for the male *Hapalemur griseus* by myself, and subsequently by Mr. Bland Sutton[1]; but although Mr. Sutton's figure supplemented my own in directing attention to a tuft of long hairs, overlooked by myself, in the neighbourhood of the patch of spines, we both of us omitted to observe one detail which will be noticed in the accompanying drawing (fig. 1, p. 450). In the specimen before me the patch of spines is very well and equally developed upon both arms; it extends down as far as the naked skin of the palm of the hand, being thus more extensive than in the former examples figured by myself and by Mr. Sutton; towards the middle of the patch the spines were distinctly longer than elsewhere; to the outside of the patch, on both arms there was a smallish oval tract of thick skin like one of the pads on the palm of the hand, with lines running transversely to its long axis. Both I myself and Mr. Sutton had failed to notice this callous pad. On re-examining the skin of the individual which I first dissected, I have found indications of this pad, which is, however, not at all clear in the dried skin. I fancy that it must also have been inconspicuous before the skin was removed; it is so plain in the specimen before me, that I cannot understand having

[1] "On the Arm-gland of Lemurs," P. Z. S. 1887, p. 391. See also Journ. of Comp. Med. and Surgery, vol. viii. p. 22.

overlooked it, if it was really conspicuous. The gland which I referred to in my former paper lies beneath the pad.

Some months ago I dissected a smaller specimen of *Hapalemur griseus* than the one described in the present paper, and found the "arm-gland" and the patch of spines covering it to be very small and inconspicuous; the genital organs of that individual were also very small, which is some evidence for regarding the arm-gland and its appurtenances as being a secondary sexual character, and not of any direct use to the animal (*e. g.* as a "climbing-organ").

Fig. 1.

Lower surface of hand of *Hapalemur griseus.*

A, callous pad overlying arm-gland; B, patch of spines; C, tuft of long hair.

I called attention in my former paper to the unusual position of the nipples, which were subsequently figured by Mr. Sutton. They have the same position in the specimen before me, and the mammary glands themselves, as previously, are comparatively largely developed. It is quite credible that they might be actually functional.

A point of some little interest in the structure of *Hapalemur* is the presence of "Peyer's patches" in the large intestine. I had noted this fact without being aware of Dr. Dobson's observations, to which, however, I was able to refer in a footnote introduced after my article had been set in type. In the present specimen the diseased condition of the alimentary tract rendered these patches unusually clear, so much so that I have thought it worth while to have the accompanying drawing prepared; this drawing (fig. 2, p. 452) will give some idea of their number and size upon one aspect of the colon. The strongly marked character of the Peyer's patches was due, Dr. Campbell informs me, not only to the pigmentation of the patches themselves, but to the anæmic condition of the alimentary tract.

Cæcum.

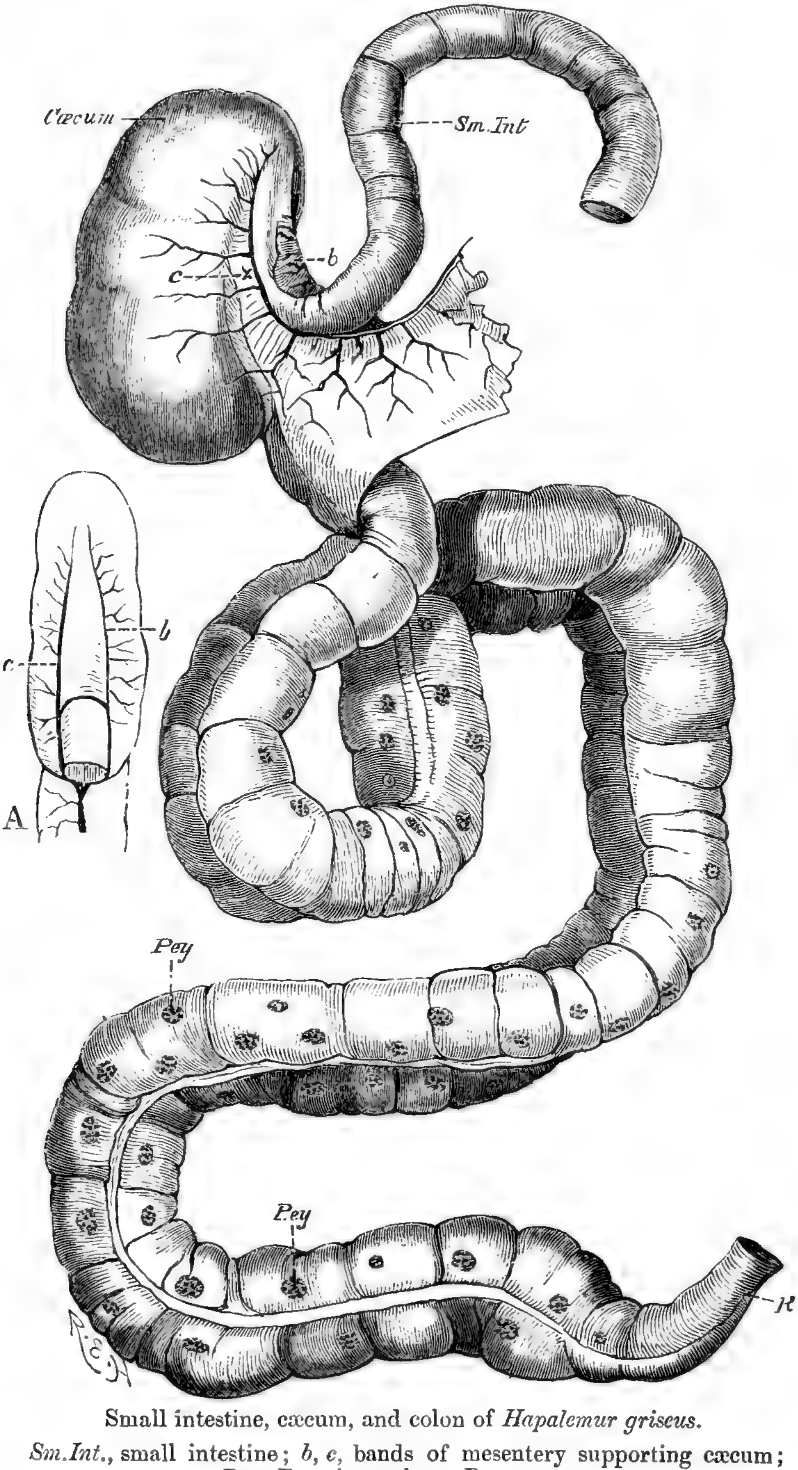
In my former paper I have described the cæcum, but not the folds of mesentery by which it is held in position. These folds show an interesting series of variations among Lemurs, which appear to have some classificatory value. The cæcum and adjacent parts of the alimentary tract of *Hapalemur griseus* are shown in the accompanying drawing (fig. 2, p. 452), which is of the natural size. Two folds (*c* and *b*) pass along the surface of the cæcum nearest to the small intestine; these folds run for a considerable distance towards the blind extremity of the gut, but do not reach it by a large interval. Both these folds bear blood-vessels, which ramify on to the cæcum itself. The two folds are symmetrically disposed with regard to each other and the small intestine; they are quite free from the latter, passing by it on each side and uniting some way behind it with the mesentery which supports the small intestine. I found this arrangement in both the examples of *Hapalemur griseus* which I dissected, and therefore regard it as the normal condition. In *Loris gracilis* the disposition of these folds is quite different. I do not refer here to the shape of the cæcum itself, or make any comparisons between different genera as regards their cæca. I merely call attention to the folds of mesentery. My attention was directed to the possible importance of this anatomical feature after making myself acquainted with Prof. Flower's description[1] of the corresponding folds in the New and Old World Monkeys.

In *Loris gracilis* the two folds already described as existing in *Hapalemur* are also found; they are, however, more extensive, reaching nearly to the extremity of the cæcum; as in *Hapalemur* they bear the blood-vessels destined for the nutrition of the cæcum. But in addition to these two folds, which evidently correspond to those of *Hapalemur*, there is a thin median fold, lying, that is to say, between the other two; this fold is much less extensive, only reaching for a short distance along the cæcum; it has no blood-vessels, and arises from the small intestine; it forms a kind of web between the small intestine and the cæcum.

Nycticebus javanicus shows some differences in detail, as regards these points, from *Loris gracilis*, but resembles that species more closely than it does *Hapalemur griseus*. Three folds are present,

[1] Medical Times and Gazette, 1872.

Fig. 2.



Small intestine, cæcum, and colon of *Hapalemur griseus.*

Sm.Int., small intestine; *b*, *c*, bands of mesentery supporting cæcum; *Pey.*, Peyer's patches; *R.*, rectum.

A. Plan of bands supporting cæcum; the gut is viewed from above, and the two bands *b* and *c* are seen to rise behind the small intestine and to pass round it on to the cæcum.

two lateral and one median; but they all three bear blood-vessels, which are, however, more extensively developed upon one of the lateral folds than upon either of the two others; this fold extends to the very end of the cæcum: the opposite lateral fold only extends for about one-quarter or less of the entire length of the cæcum; instead of being attached, as it is in *Loris*, to the gut independently of the middle fold, it is attached in common with the latter: the median fold is small but not, as it is in *Loris*, anangious; it bears a small blood-vessel.

Nycticebus tardigradus.—The cæcum of a spirit-specimen was cut out carefully and distended with air; when dry the relations of the folds to the cæcum and to the small intestine were quite clear, and the presence or absence of blcod-vessels could be made out owing to the fact of their being naturally injected.

There is one principal fold which arises behind the small intestine from the mesentery connecting this and the colon; this fold passes to within a quarter of an inch of the extremity of the cæcum, gradually getting shallower as it approaches the apex of that organ; it is deepest where it passes to one side of the small intestine; it bears a conspicuous blood-vessel which gives off branches to the cæcum. Corresponding to this on the other side of the small intestine is a very slightly marked fold, also bearing a blood-vessel, which only just passes beyond the small intestine; it arises from the ileo-colic mesentery, exactly opposite the origin of the well-developed cæcal mesentery of the opposite side. From the small intestine itself a small anangious fold arises, about half an inch in vertical diameter, which joins the strongly developed vascular fold.

Galago alleni.—The cæcum of this species was extracted from a spirit-specimen and distended with air. The most prominent fold is one from the small intestine, which is attached to the cæcum for nearly its whole length. On one side a very small fold arises from the cæcum itslf, and is attached to the median fold; it bears the blood-vessels supplying the cæcum, which run along the single mesentery formed by the junction of this with the median anangious fold.

In the Potto (*Perodicticus potto*) I have examined the fresh cæcum as well as one extracted from a spirit-specimen and distended with air. The folds are closely similar to those of *Nycticebus tardigradus*, but present certain differences of detail (see fig. 3, p. 455).

There is one strongly marked fold which runs nearly to the end of the cæcum, but not quite so nearly to the end as in *Nycticebus tardigradus*. The cæcum of the Potto has a kind of vermiform appendix, and at the junction of this with the wider part of the cæcum the fold in question is deepest, becoming shallower both in front of and behind this region: there is a second lateral fold on the opposite side of the cæcum, which is rather more extensive than it is in *Nycticebus tardigradus*; it reaches on to the cæcum for a space of about half an inch beyond the ileo-cæcal junction. From the small intestine is given off an anangious fold, which is attached independently to the cæcum, though from the point where it ceases to be visible as a fold a line may be traced running to the larger of the two lateral folds, to which the attachment of the anangious fold is more closely approximated.

Cheirogaleus (Microcebus) smithi.—This Lemur agrees closely with *Galago.* The median anangious fold arising from the small intestine is very large; there is only one lateral fold bearing a blood-vessel, which fuses with the median fold; this lateral fold arises behind the small intestine from the ileo-colic mesentery; the same is probably true of *Galago,* though my specimen did not show it.

Of the genus *Lemur* I have examined the following species, viz. *L. brunneus, L. rufifrons, L. albifrons, L. varius,* and *L. anjuanensis.*

In *Lemur brunneus* there are only two folds attached to the cæcum; one of these extends to the very extremity of that appendage, arising not from the small intestine, but from the mesentery behind the small intestine which attaches it to the colon; this fold bears a blood-vessel; the second fold is very short and apparently completely anangious; it arises from the small intestine itself and is attached to the first-mentioned fold, so that there is but one line of attachment to the cæcum; the attachment of the second (anangious) fold to the first is for a distance of not more than one fifth of its length.

Lemur rufifrons appears to be exactly like the last species in the number and disposition of the mesenteric folds attached to the cæcum.

Lemur albifrons differs from the last two species only in the reduction of the anangious fold arising from the small intestine.

In *Lemur varius* this fold is still further reduced and has become quite rudimentary.

Lemur anjuanensis, as regards the folds (see fig. 3, p. 455), is precisely like *Lemur brunneus.*

As regards the disposition of the folds of mesentery connected with the cæcum, the genera mentioned in the present paper appear to fall into three groups:—

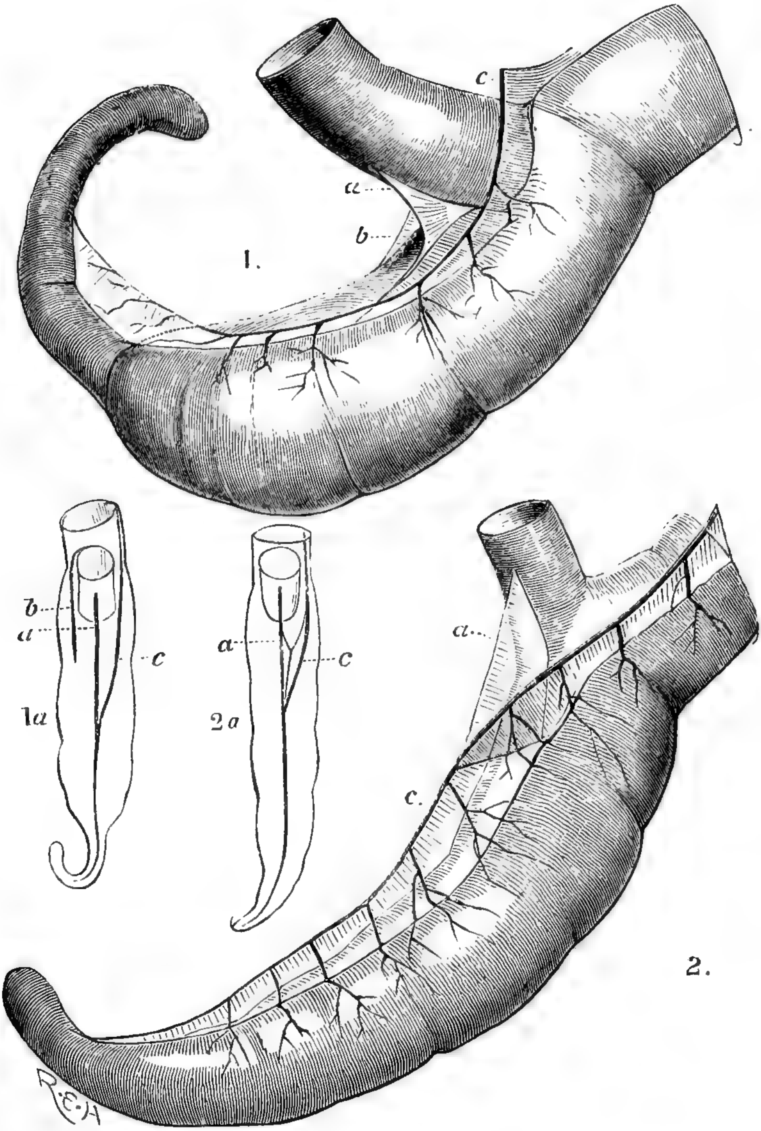
(1) *Hapalemur* stands apart from the rest in possessing only the two lateral folds, both of which bear blood-vessels.

(2) In *Lemur, Galago,* and *Microcebus* (= *Cheirogaleus*) only one of the two lateral, vessel-bearing, folds is present; in addition to this there is an anangious fold arising from the ileum and inserted on to the lateral fold.

(3) In *Loris, Nycticebus,* and *Perodicticus* all three folds are present, but one of the lateral folds is generally much more developed than the other. The median frenum may (*Nycticebus*) or may not (*Perodicticus*) be attached to the larger of the two lateral folds.

It might be supposed that the *raison d'être* of the persistence of the median frenum was to assist in preventing the displacement of the cæcum; the short sac-like cæcum of *Hapalemur,* which is without the median frenum, might, on account of its shape and relative size, be less easily displaced or bent than the elongated cæcum of *Lemur* or *Perodicticus.*

Fig. 3.



1. Cæcum of *Perodicticus potto*: *b* and *c* bands corresponding to those similarly lettered in fig. 2; *a*, median anangious fold.

1 *a*. Plan of bands constructed as in fig. 2 A.

2. Cæcum of *Lemur anjuanensis*. Letters as above.

2 *a*. Plan of cæcum and bands of the same.

We must undoubtedly regard this bloodless fold of membrane—the frenum—as Mr. Treves[1] has pointed out, as being the true mesentery of the cæcum, and the development of the lateral folds as an entirely secondary process.

Looking at the matter from this point of view *Hapalemur* is evidently, when compared with *Lemur*, a specialized type. It is not, however, so easy to decide whether the Lorisinæ or the Lemurinæ include the older types. Perhaps the presence of *two* lateral folds in the Lorisinæ is evidence of a more specialized condition than is shown by either the Lemurinæ or Galagininæ, where only *one* is developed. On the other hand, the independence of the frenum and the lateral fold in *Loris* and the Potto, as contrasted with their fusion in *Lemur* (also, however, in *Nycticebus*), might be used as an argument on the other side.

There can, however, be no doubt, and that is rather the point upon which I wish to dwell in the present communication, that *Hapalemur* is so far a specialized type of *Lemur* in that it has lost the true mesentery of the cæcum. Whether this is, or is not, correlated with the altered form of the cæcum itself is not a matter of importance, since in any case the organ itself shows a departure from the ordinary Lemurine cæcum in its shape.

Brain.

The brain was carefully extracted, and is in an excellent state of preservation. In the hardened brain I have made the following measurements, which are placed side by side with corresponding measurements of well-preserved brains of *Lemur anjuanensis* and *Galago crassicaudatus*.

	Hapalemur.	*Lemur.*	*Galago.*
	mm.	mm.	mm.
Total length	36	42	35
Greatest breadth	26·5	33	27
Length of hemisphere	33	37·5	32
Greatest depth	19	23·5	17

From these measurements it follows that the brain of *Lemur* is broader as well as deeper than that of *Hapalemur*, that the brain of *Galago* is broader but shallower than that of *Hapalemur*, and that the brain of *Lemur* is just perceptibly broader but considerably deeper than that of *Galago*.

The narrowness of the brain of *Hapalemur*, as contrasted with the other types used for comparison, is indeed apparent to the eye without making accurate measurements to prove it.

As will be also seen from the above table, the difference in length between the brains of *Hapalemur* and *Galago* is very small; the

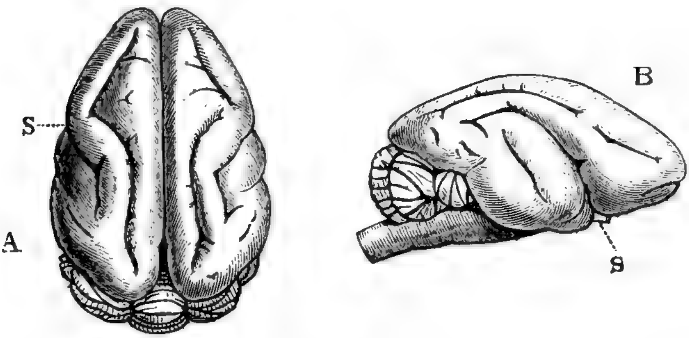
[1] "The Anatomy of the Intestinal Canal and Peritoneum in Man." Hunterian Lecture, 1885. London, 1885.

two Lemurs themselves are of about the same size; but it is interesting to note that the brain of *Hapalemur* is distinctly larger in total size. I cannot compare it with the brain of *Lemur anjuanensis*, as I did not preserve any record of the measurements of that individual.

As there is no description, so far at least as I am aware, of the brain of *Hapalemur*, I have considered it worth to give the following description illustrated by the drawings which I exhibit (fig. 4, A and B).

The brain of *Hapalemur* is of an oval form: it is not sharply compressed anteriorly, as is the brain of *Lemur*; neither do the hemispheres diverge from each other so markedly behind as in that

Fig. 4.



Brain of *Hapalemur griseus*.

A, from above; B, lateral view; S (in both figures), Sylvian fissure.

genus and *Galago*. The convolutions, however, show only slight differences from those of *Lemur*. In Professor Flower's figure of the brain of *Lemur nigrifrons*[1] the angular sulcus is quite distinct from the infero-frontal, and I find that this is also the case with *Lemur anjuanensis*. In *Hapalemur griseus* these two furrows are present, as shown in the accompanying drawing, and have precisely the same shape as in *Lemur*; but there is hardly a break between the anterior end of the angular sulcus and the posterior end of the infero-frontal; they form practically a continuous sulcus. The Sylvian fissure in *Hapalemur* extends rather further back than in *Lemur*, running for a short distance parallel with the angular fissure; with the exception of these small differences, the brains of *Hapalemur* and *Lemur* appear to me to be very similar.

Prof. Milne-Edwards has devoted two plates of the magnificent 'Histoire de Madagascar'[2] to the illustration of the brains of the Indrisinæ; those of the genera *Propithecus*, *Indris*, and *Avahi* are figured in many aspects. It is quite clear from these admirable figures that while there are not wide differences between the Indrisinæ and other Lemurs, the brain-configuration of the former shows no

[1] "On the Brain of the Javan Loris (*Stenops javanicus*, Illig.)," Tr. Z. S. vol. v. p. 103.

[2] 'Histoire Naturelle etc. de Madagascar,' Mammifères, Atlas, pls. 86, 87.

special resemblances to that of *Hapalemur*. Nor can I find a close resemblance between the brain of *Hapalemur* and that of any of the *Loris* group (i. e. *Loris, Nycticebus,* and *Perodicticus*[1]). The brain-structure of *Hapalemur* undoubtedly justifies its position in the subfamily Lemurinæ.

Myology.

As regards their myology, the Lemurs are one of the best-known groups; there are, indeed, comparatively few types which have not been dissected; as *Hapalemur* is one of these types, the present notes may be of use, if only as a further proof of the great uniformity in the muscular structure of these animals.

The principal memoirs, which have served me as a basis of comparison between *Hapalemur* and other forms, are those of Murie and Mivart and of Milne-Edwards.

Messrs. Murie and Mivart sum up, in their elaborate treatise on the myology of the Lemurs[2], all the observations made previously to that publication—a proceeding which has not only enabled them to take a general survey of the importance of the muscular anatomy for classificatory purposes, but is also very saving of trouble to those who come after. Prof. Milne-Edwards[3] deals with the muscular structure of the Indrisinæ. As it is clearly to the types described by these writers that *Hapalemur* is related, I have not specially compared its muscles with those of the aberrant *Chiromys,* first described by Sir Richard Owen[4], and more recently by Dr. J. F. Oudemans[5], or with *Tarsius.*

In the following account of the muscles of *Hapalemur griseus* I only describe those of the limbs, and for the most part only mention those which show any variation in the different genera, and those which show modifications characteristic of the whole group Lemuroidea, such as, for example, the origin of the *Rectus femoris* by a double tendon.

Fore Limb.

1. *Trapezius.*—The origin of this muscle commences at about the middle of the neck, and extends backwards so as to just overlap the latissimus dorsi; it is inserted on to the spine of the scapula, on to the posterior third of the hind margin, and on to nearly the whole of the front margin, being continuous in front with the levator claviculæ; the two muscles are here so completely continuous that it is impossible to say that one overlaps the other.

2. *Rhomboideus.*—This muscle is single.

[1] The brain of *Arctocebus calabarensis* has not, so far as I am aware, been described.

[2] "The Anatomy of the Lemuroidea," Tr. Z. S. vol. vii. p. 1.

[3] 'Histoire Naturelle etc. de Madagascar,' Mammifères.

[4] "On the Aye-Aye (*Chiromys,* Cuvier; *Chiromys madagascariensis,* Desm.; *Sciurus madagascariensis,* Gmel., Sonnerat; *Lemur psilodactylus,* Schreber, Shaw)," Tr. Z. S. vol. v. p. 33.

[5] "Beiträge zur Kenntniss der *Chiromys madagascariensis,*" Verh. Ak. Amst. xxvii.

3. *Latissimus dorsi* from the posterior dorsal vertebræ, slightly overlapped in front by the trapezius, and from the lumbar fascia; it gives off a very decided slip to the pectoralis, which is attached to that muscle by a flat tendon.

4. *Dorso-epitrochlear* arises from the latissimus dorsi just before it becomes tendinous; it is inserted by a broad thin tendon on to the ulna for a space of $\frac{1}{2}$–$\frac{3}{4}$ inch from the olecranon.

5. *Serratus magnus* arises from the first 8 ribs and from the cervical vertebræ; it is attached to the posterior two-thirds of the vertebral border of the scapula.

6. *Pectoralis major* consists of two separable parts only: (1) a clavicular portion from the sterno-clavicular articulation, and (2) a pectoral portion from the sternum and from a few ribs behind the sternum.

I could find no trace of the second pectoral muscle, *Pectoralis minor*.

7. The *Subclavius* passes from the first rib to the clavicle.

8. *Biceps*.—This muscle is two-headed: the long head arises by a long flat tendon passing underneath an annular ligament; the second head arises in common with the *coraco-brachialis longus* and is apparently fused with that muscle for some way.

9. *Coraco-brachialis* is also a double muscle; the part lying behind the insertion of the teres major (the other part lies in front) is very short and only reaches about one quarter way down the insertion of the said muscle.

10. *Triceps* has the usual three heads: the long head arises from the lower border of the scapula and also from a fascia covering the infra-spinatus; the second head arises from the head of the humerus; the third from nearly the whole of the shaft of the humerus; the anterior part of this forms an almost distinct head, which appears to correspond to that referred to by Messrs. Murie and Mivart as the "fourth head."

11. *Brachialis anticus* arises high up on the radial side of the humerus and twists round to the other side, receiving fibres the whole way.

12. The *Teres major* is a large muscle, inserted as usual and separately by a stout flat tendon.

13. *Teres minor* is present, as in other Lemurs.

14. *Flexor sublimis digitorum*.—This is a small muscle arising from the internal condyle of the humerus; about halfway down the forearm a thin tendon is given off which passes to the conjoined deep flexor tendons; later the tendon of this muscle splits into four, which supply digits II.–V. The two middle tendons are the thickest and are of equal size; the two outer tendons are considerably thinner, but also equisized.

15. The *Palmaris longus* arises from the internal condyle; the tendon is $\frac{2}{3}$ of the length of the entire muscle.

16. *Flexor carpi ulnaris* is not in any way remarkable.

17, 18. The *Flexor profundus digitorum* and the *Flexor longus pollicis* blend together before the wrist while yet muscular, though covered on the under surface by tendon; the muscles are not at all distinct: the *flexor profundus* arises by one head from the ulna; the *flexor pollicis* by two heads, one from the internal condyle of the humerus, the other from the radius.

19. *Extensor communis digitorum.*—The muscle divides into three tendons high up in the arm: the outermost of these divides into two, one branch supplying digit V., the other fusing with the middle of the three tendons: the tendon so formed divides into three; two of the branches supply digits IV. and III.; the remaining branch fuses with the innermost of the three tendons and supplies digit II.

20. The *Extensor secundi internodii pollicis* is a long and slender muscle; it arises high up on the ulna from its radial surface; the tendon of the muscle commences about halfway down the forearm; it is inserted on the terminal phalanx of thumb.

21. The *Extensor ossis metacarpi pollicis* is a broad, flat, bipinnate muscle arising from anterior two-thirds of radius and from the interosseous membrane; its tendon crosses over the area a little before the wrist and is attached to the radial side of the head of the first metacarpal.

22. *Extensor carpi radialis longior.*—This muscle arises from the ridge on the humerus leading to the extensor condyle; its tendon commences before halfway down the forearm and is inserted on to the radial side of the head of the second metacarpal.

23. *Extensor carpi radialis brevior.*—This muscle arises from the extensor condyle of the humerus and from the septum between itself and the extensor communis digitorum; its tendon is inserted on to the outer side of the middle (3rd) metacarpal.

24. *Extensor minimi digiti* is a tolerably long and slender muscle, arising from the external condyle of the humerus; it divides at the wrist into two tendons, which are inserted on to ulnar side of IVth and Vth digits; just before its bifurcation it receives a slender tendon from the extensor indicis.

25. *Extensor carpi ulnaris* arises from the extensor condyle of the humerus and from the ulna; it is a single insertion.

26. The *Extensor indicis* arises from the radial surface of the ulna and from the interosseous ligament; it divides into two tendons; one of these joins the extensor minimi digiti as already described and besides ends in a fascia; the other tendon goes to index.

Hind Limb.

1. The *Glutæus maximus* is, as in other Lemurs, composed of two separate parts; the insertion of the posterior part of the muscle extends right along the femur to its very end.

2. The *Rectus femoris* arises by a strong round tendon, which is bifurcate at the origin; the muscle is covered by the vastus externus.

3. The *Vastus externus* is large and fleshy; it presents no peculiarities of origin or insertion.

4. The *Vastus internus* is barely half the size of the vastus externus.

5. The *Cruræus* arises from nearly the whole length of the femur.

All these four muscles are attached to the fascia; they are merely mentioned in order to show that there is nothing abnormal about them.

6. *Biceps femoris.*—This muscle arises by a long strong tendon from the ischial tuberosity; it is inserted by a long, flat, and excessively thin tendon on to fascia covering legs and on to tibia; it is connected at its origin with

7. *Semitendinosus.*—The *Semitendinosus* is a thin muscle fleshy at its origin; it is inserted by a long flat tendon, more than one inch in length, on to the cnemial crest of tibia in front of and below insertion of sartorius.

8. The *Semimembranosus* is a much larger muscle; it arises from the ischium, behind the origin of the semitendinosus, but is slightly overlapped by that muscle in the front portion of its origin; its insertion is by a strong, flat, but short tendon on to the head of tibia.

9. The *Gracilis* arises from the symphysis pubis; it is fused near its insertion with sartorius, and both are inserted by a common tendon along with the semitendinosus.

10, 11. *Gastrocnemius* and *Soleus* appear to form one muscle with three heads; the soleus arises from the fibula by a flat ribbon-shaped tendon.

The *Plantaris* was totally absent.

12. The *Tibialis posticus* ends in a long tendon inserted into tarsus at base of great toe; its origin is hidden below flexors.

13, 14. The *Flexor longus hallucis* and the *Flexor digitorum* both give off a tendon to the hallux; they blend before the division of the latter into the tendons of digits.

15. The *Tibialis anticus* arises from the tibia only, and not from the femur also.

16. The *Extensor proprius hallucis* is long and slender; it supplies last phalanx of hallux.

There are, as in other Lemurs, four Peroneals.

The account of the myology given above so far as it goes lends support to Messrs. Mivart and Murie's conclusion that "there is nothing of a very singular nature in the muscles distinguishing any one genus from its fellows."

There is no peculiarity that I have been able to discover which is distinctive of the genus *Hapalemur.*

Where the genera of Lemurs differ among themselves, *Hapalemur* nearly always comes nearest to *Lemur.* This is the case with the majority of the muscles dissected by me, but it is not invariably so; a comparison of my descriptions will show a few points of agreement with genera other than *Lemur*: for example, the absence of a *Pectoralis secundus* allies *Hapalemur* not to the genus *Galago,* but to *Galago alleni* only; in the absence of a plantaris muscle *Hapalemur* agrees with *Loris, Nycticebus, Perodicticus,* and apparently also *Galago peli.*

8. On an interesting Example of Protective Mimicry discovered by Mr. W. L. Sclater in British Guiana. By Edward B. Poulton, M.A., F.R.S.

[Received June 16, 1891.]

(Plate XXXVI.)

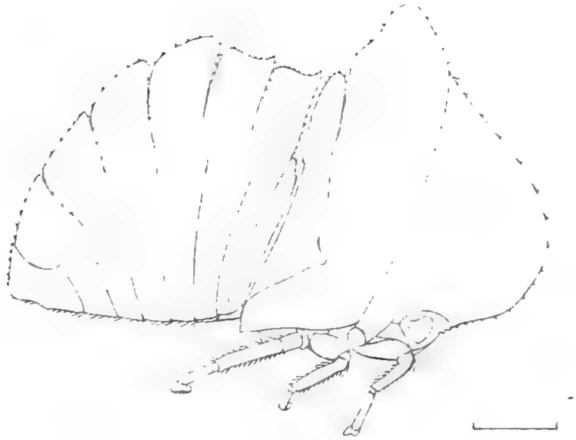
An example of Protective Mimicry which I believe to be more wonderful in its detail and complexity than any which has been hitherto described, was observed and interpreted by my friend Mr. W. L. Sclater in 1886 during his investigations in British Guiana. Knowing that I was interested in the subject, Mr. Sclater kindly communicated the observation to me and placed his material at my disposal. I have already given a brief account of the example[1], but it seems of sufficient importance and interest to demand illustration; and I take the opportunity of saying a little more about it and of answering criticisms.

Mr. Sclater and his native servant had been collecting insects by shaking the branches of a tree over a sheet. The servant, although described as a very acute observer, saw an insect on the sheet which he mistook for one of the abundant Cooshie Ants (*Œcodoma cephalotis*) carrying its little jagged segment of leaf over its back. Mr. Sclater looked more closely and saw that it was an entirely different insect belonging to the order Homoptera. The specimen has been submitted to Mr. C. Waterhouse, who states that it is an immature stage of a species belonging to the family *Membracidæ* and probably to the genus *Stegaspis*.

Its length is 9·3 mm., or about that of an ant carrying its leaf. The leaf is represented by the thin flattened body of the insect, which in its dorsal part is so compressed laterally that it is no thicker than a leaf and terminates in a sharp jagged edge (Plate XXXVI. figs. 1, 2). The head and legs were apparently brown, and suggested the appearance of that part of an ant which is uncovered by the piece of leaf. The jagged dorsal line when seen in profile evidently corresponds to the roughly gnawed edge of the fragment of leaf; for Mr. Sclater tells me that the contour of the latter is generally shaped by the mandibles of the ant rather than due to the natural margin, as represented in fig. 2.

It is probable that the Homopterous insect invariably frequents trees where too the ants would be well known and abundant. "The example is, as far as I am aware, unique in the detail with which the original is reproduced; not only is the specially protected species copied, but it is depicted at its usual occupation, and the material upon which it labours is also included in the picture."[2] It is nevertheless possible to trace, with very probable correctness, the path by which natural selection has produced so marvellous a result.

[1] 'Colours of Animals,' London, pp. 252–532.
[2] *Ibid.* p. 253.



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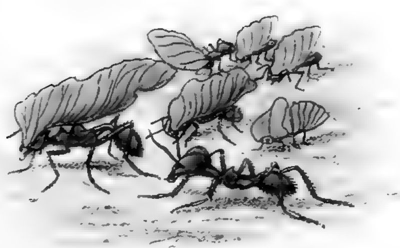

3.

E. B. Poulton &
H. M. J. Underhill del. J. Smit lith.

Mintern Bros. imp.

PROTECTIVE MIMICRY IN A HOMOPTEROUS INSECT.

There is little doubt that we have to do with a palatable insect much relished by insect-eating foes, which defended itself, like the great majority of its allies, by Protective Resemblance (Procryptic Colouring), in this case by a likeness to leaves. The green colour and compressed body were probably evolved in response to the need for concealment. But as the increasing acuteness of foes, also subject to natural selection, enabled them to see through a disguise which is so universally adopted by palatable insects, it became of advantage to certain hard-pressed forms to resemble something which was positively objectionable to their enemies rather than merely useless and uninteresting. And in this case the transition from Protective Resemblance to Protective Mimicry (Pseudaposematic Colouring) would be especially easy, for it would be brought about by comparatively insignificant modifications of colour and form. Such an easy transition into so marvellous a method of defence is of course due to the accident that specially defended insects generally associated with pieces of leaf are well known in the same locality.

My friend Col. Swinhoe has objected to this interpretation that it is extremely difficult to believe that the habit of the ant has been continued sufficiently long for the change to have been produced in the Homopterous insect. But the habit seems to be very ancient, inasmuch as it is common to a group of species inhabiting tropical America, and presumably dates from the time of their origin in a common ancestor. Furthermore it has been shown that, detailed as the resemblance certainly is, it was probably prepared for by an earlier resemblance to leaves alone.

It must also be remembered that several species of the genus *Stegaspis* are known in tropical America, and that the published figures and descriptions of these show that the same shape and outline are characteristic of the whole. It is therefore extremely probable that Mr. Sclater's interpretation applies to a group of closely allied Homopterous insects inhabiting a district where the various species of leaf-carrying ants are well known and abundant.

In the preparation of the Plate accompanying this paper I have to thank Miss Kelly for kindly lending me some sketches of living Cooshie Ants bearing leaves; these sketches, drawn upon the spot, were of especial value. Miss Horman Fisher also made for me a careful drawing of a leaf-carrying Ant in the Natural History Museum. Mr. H. M. J. Underhill has prepared the coloured figures from this material.

DESCRIPTION OF PLATE XXXVI.

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2. A representation of the *Stegaspis* (on the right) beside the leaf-carrying Ant (on the left). The fragment of leaf carried by the latter is generally gnawed along its upper edge. The figure of the ant was chiefly adapted from Miss Horman Fisher's drawing of a specimen in the Natural History Museum.

Fig. 3. A group of Cooshie Ants, all except one carrying leaves. On the right of the figure the Homopterous insect is represented. The figure is intended to show how complete the resemblance must be when the *Stegaspis* is near a group of ants. It is improbable, however, that the *Stegaspis* would be found among the ants on the ground as represented in the Plate. The figures of ants were chiefly adapted from Miss Kelly's sketches.

June 2, 1891 (*continued*).

June 16, 1891.

LIST OF PLATES.

1891.

PART III.

NOTICE.

The 'Proceedings' are issued in *four* parts, as follows:—

Part	I. containing papers read in January and February, on June 1st.				
	II.	,,	,,	,,	March and April, on August 1st.
	III.	,,	,,	,,	May and June, on October 1st.
	IV.	,,	,,	,,	November and December, on April 1st.

PROCEEDINGS

OF THE

GENERAL MEETINGS FOR SCIENTIFIC BUSINESS

OF THE

ZOOLOGICAL SOCIETY

OF LONDON,

FOR THE YEAR

1891.

PART IV.

CONTAINING PAPERS READ IN

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LIST OF CONTENTS.

PART IV.—1891.

November 3, 1891.

November 17, 1891.

Contents continued on page 3 of Wrapper.

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November 3, 1891.

Prof. Flower, C.B., LL.D., F.R.S., President, in the Chair.

The Secretary read the following reports on the additions made to the Society's Menagerie during the months of June, July, August, and September, 1891:—

The registered additions to the Society's Menagerie during the month of June were 148, of which 79 were by presentation, 10 by purchase, 2 by exchange, 38 by birth, and 19 were received on deposit. The total number of departures during the same period by death and removals was 71.

Amongst the additions I may invite special attention to the following:—

1. A Great Black-headed Gull (*Larus ichthyaetus*), kindly brought to us by Mr. B. T. Ffinch, C.M.Z.S., on his recent return home from the Persian Gulf. This is the first specimen of this fine bird that we have received alive.

2. Three examples of the Tibetan Crossoptilon (*Crossoptilon tibetanum*), obtained in the mountains of Szechuen, near Ta-tsien-lo, by Mr. E. A. Pratt, and purchased of him. These birds, which are new to the Society's Collection, were procured by Mr. Pratt during his recent journey in Western China (see Proc. R. Geogr. Soc. 1891, p. 339, and Ibis, 1891, p. 378).

3. A young female of the Sinaitic Ibex (*Capra sinaitica*), obtained from the Erba Mountains on the coast of the Red Sea, about 120 miles north of Suakim, by Sir James Anderson, and presented to the Society.

The same generous donor has previously presented us with a male example of this Ibex (P. Z. S. 1889, p. 246), which is doing well in the Gardens, so that the female is doubly welcome.

The registered additions to the Society's Menagerie during the month of July were 115 in number; of these 41 were acquired by presentation, 14 by purchase, 29 by birth, and 31 were received on deposit. The total number of departures during the same period by death and removals was 77.

The registered additions to the Society's Menagerie during the month of August were 100 in number; of these 70 were acquired by presentation, 1 by purchase, 1 by birth, 2 by exchange, and 26 were received on deposit. The total number of departures during the same period by death and removals was 86.

The registered additions to the Society's Menagerie during the month of September were 92 in number; of these 61 were acquired by presentation, 17 by purchase, 4 by exchange, 3 were bred in the Gardens, and 7 were received on deposit. The total number of departures during the same period by death and removals was 79.

Amongst the additions I may invite special attention to the following:—

1. A Dorsal Hyrax (*Hyrax dorsalis*) from Sierra Leone, presented by C. Burney Mitford, Esq., Colonial Treasurer, Sierra Leone, received September 3rd.

This species is new to our list. It may be compared with the specimen of *Hyrax capensis*, which is now in the cage alongside of it.

2. A collection of animals from the territories of the Imperial British East Africa Company, presented by Keith Anstruther, Esq., of that Company's service. These comprise a specimen of a rare Monkey—the Mozambique Monkey (*Cercopithecus rufo-viridis*), of which no example has reached the Society since 1860. The present specimen is from the Kilimanjaro district. Mr. Anstruther also sent us a pair of Ostriches, of which only the female has reached us alive. It appears to belong to the form with blue naked skin named *Struthio molybdophanes* by Dr. Cabanis (J. f. O. 1884, p. 229).

Mr. Keith Anstruther has recently changed his quarters from Taveta to Malindi, where Hippopotamuses are abundant, and has kindly undertaken to make every endeavour to procure for us a young pair of this animal, which we much require.

3. Two Cormorants from New Zealand, presented by the Earl of Onslow, G.C.M.G., Governor of New Zealand, through the kind intervention of Captain F. H. Salvin, who is, as is well known, specially interested in birds of this group. These birds seem to be referable to the Pied Shag, *Phalacrocorax varius* (see Buller's 'Birds of New Zealand,' ed. 2, ii. p. 149, pl. xxxviii.), but do not quite agree with Sir W. Buller's description.

4. A young Agami Heron (*Ardea agami*) from Surinam, presented September 25th by Mr. Frank Fisher. This Heron is new to the Society's list.

The Secretary exhibited, on behalf of Mr. F. E. Blaauw, C.M.Z.S., a stuffed example of a young Wondrous Grass-Finch (*Poephila mirabilis*), bred in captivity at his house (S'Graveland, Hilversum, Holland), together with a nest and egg of this species, and read some extracts from his letter on the breeding of this bird:—

"The male of my pair of *Poephila mirabilis* is exactly like the bird represented in Gould's 'Birds of Australia.' The female is a little smaller and has no lengthened tail-feathers. The head at the first aspect looks black, but when examined closely is found to have a dark red glow, and even to have some dark red feathers. The breast is of a very pale bluish pink; the rest of the plumage resembles that of the male, but all the colours are more indistinct. The young when they left the nest were conspicuous by the three beautiful pearl-like excrescences which are placed at each corner of the bill. They form a triangle, of which two are of a very fine pearl-like blue, and the third of a pale buff-colour. When the bird opens its mouth the buff-coloured pearl is found to be the real corner of the bill, whilst on each side is a blue pearl. The beak itself is of a shining black colour, the head is grey, the throat lighter. The breast is a greyish buff, gradually melting into the yellowish white of the belly. The back is olive-green, and the tail-coverts bluish green.

"The egg is white. The nest, as will be seen, has no roof to it, as have the nests of most Australian Grass-Finches, but is an open construction of some dried weeds and grass, and was placed in a little wooden box, of which the front was open.

"Five little birds came out, and at the age of about three weeks, I think, flew out, and were very active and independent from the beginning. The old birds have fed them entirely on canary-seed and white millet. They used no ants'-eggs or anything of that sort.

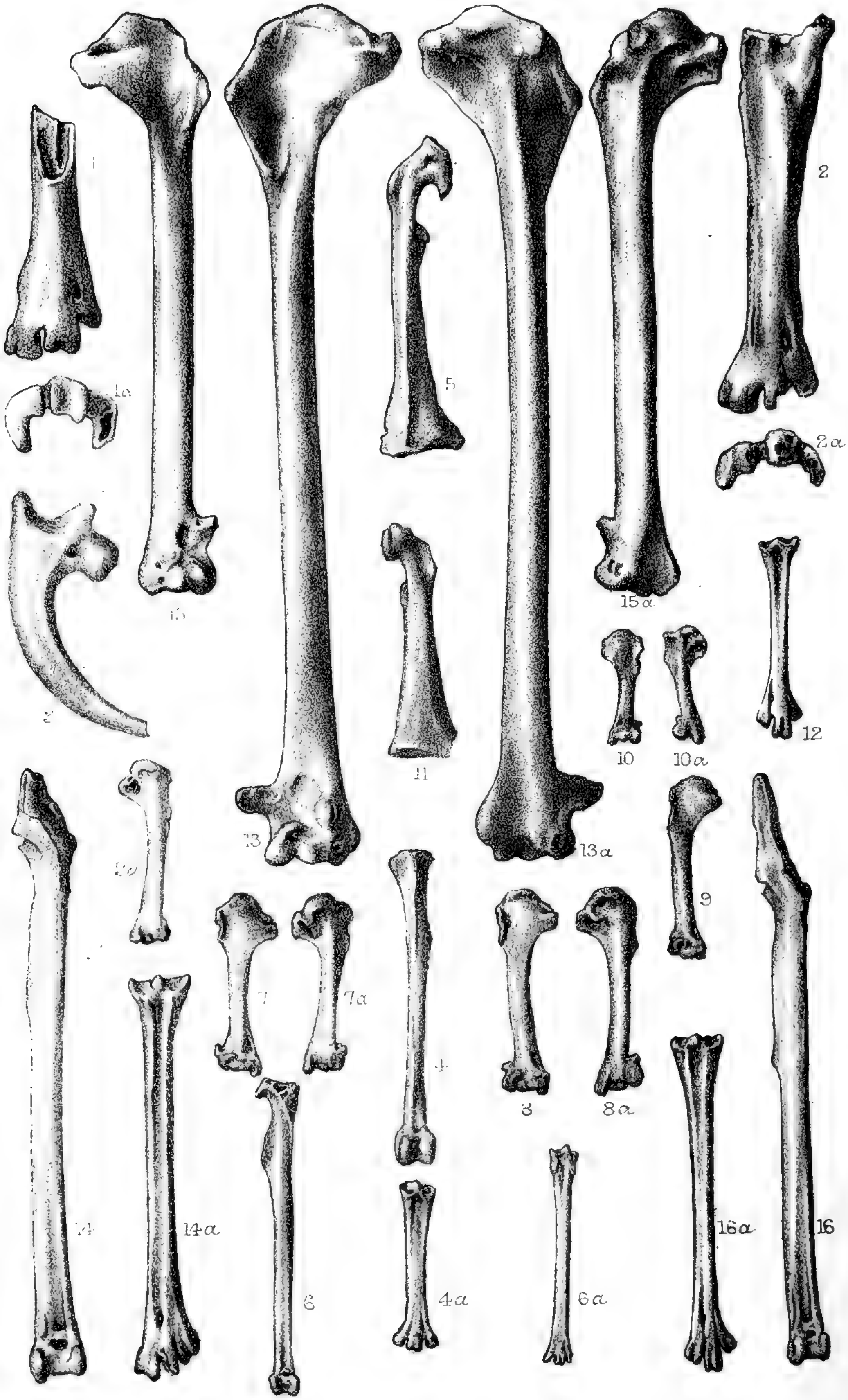
"They seem to be perfect vegetable-feeders. How the plumage of the young birds changes I hope to be able to let you know later."

The Secretary exhibited, on behalf of Prof. E. C. Stirling, of the University, Adelaide, C.M.Z.S., an original water-colour drawing of the new Australian Mammal, *Notoryctes typhlops*, prepared from a pencil-sketch taken from life. Prof. Stirling had written as follows:—

"This drawing represents the animal in an observed attitude, and shows one or two of the characteristics which I have described. The ground is the red sand so prevalent in the interior, and is coloured from a sample I brought down. The 'tussocks' are those of *Ariodia irritans*, the Porcupine-Grass or *spinifex* of the Interior, some of the tussocks being in flower. For the sake of the distance and perspective they have been represented proportionately too small; but the sketch conveys very well the idea of the kind of country the animals are found in, *i. e.*, bare sand, with scattered tussocks of this pointed grass."

Mr. Boulanger exhibited an Iguana with reproduced tail, and made the following remarks:—

"The specimen of *Iguana tuberculata*, from Curaçao, which I exhibit, was received a few days ago at the Natural History Museum. It is interesting for having the tail regenerated—a somewhat unusual occurrence in this well-known Lizard, and especially for the remarkable appearance of the restored portion. The caudal scales in *Iguana* are disposed in verticils, but on the regenerated organ they are arranged quincuncially; and instead of the black annuli we have a black dorsal stripe. This stripe begins at the base of the regenerated portion, a little to the right, at the posterior edge



F. C. Woodward del. et lith.

West, Newman imp.

Bird Bones from Corsica & Sardinia.

of the second black ring, where the tail was broken, as if given off by the only point of the ring encroached upon by the somewhat oblique fracture, and it extends to the tip. Few Iguanoids have striped tails. In fact I know but a few species, belonging to the genera *Liolæmus* and *Sceloporus*, which are so marked, and these genera happen to be among the few in the family which have the scales normally disposed quincuncially, at least in the basal part of the tail, as in the reproduced tails of nearly all Iguanoids. However, the manner in which the stripe originates in the present specimen perhaps excludes any explanation based on phylogenetic considerations. But it is a most remarkable fact how constant the type of scaling of the regenerated tail in these *Iguanidæ* is, in spite of so much diversity in the scaling of the intact organ, as shown by *Hoplurus*, *Ctenosaura*, *Liolæmus*, and many others which I have been able to examine [1]; whilst, on the other hand, all *Lacertidæ*, *Teiidæ*, *Zonuridæ*, and *Gerrhosauridæ* reproduce verticillate tails, whatever their normal scaling may be."

Mr. R. Gordon Wickham exhibited a remarkably fine pair of horns of the Gemsbok Antelope (*Oryx gazella*) obtained near Port Elizabeth, Cape Colony.

The following papers were read:—

1. On Pleistocene Bird-remains from the Sardinian and Corsican Islands. By R. Lydekker, B.A.

[Received July 30, 1891.]

(Plate XXXVII.)

During the past summer I received from my friend Prof. C. J. Forsyth Major, of Florence, a small collection of bird-bones from Pleistocene deposits in the Sardinian and Corsican islands, with the request that I would undertake their examination. The great majority of these specimens were obtained from a cave at Pietro Tampoia in the island of Tavolara, on the north-east coast of Sardinia; while others came from the ossiferous breccia of Monte San Giovanni, near the town of Iglesias, in the south-western corner of Sardinia itself. The remainder are from a breccia at Toga, near Bastia, Corsica.

The specimens forming this collection are by no means the first bird-remains which have been obtained from the Sardinian islands, since as far back as 1832 Rudolph Wagner [2] described and figured a considerable number of bird-bones from the ossiferous breccia of Cagliari. None of these specimens were, however, specifically

[1] I find, however, the verticillate scaling on the reproduced tails of *Uta elegans* and *U. nigricans*.

[2] Abh. Münch. Akad. vol. i. pp. 751–786.

determined, while in many cases even their generic position was considered doubtful; although it was suggested that they belonged[1] to the genera *Aquila, Buteo, Strix, Picus, Corvus, Turdus, Alauda, Fringilla, Sterna*, and *Anas*. Further, it appears to have been considered probable that many or all of these specimens would prove to belong to existing species. It may be added that of the generic terms mentioned above several appear to be used in their original wide Linnean sense.

It may be observed that the majority of the Mammalian remains from the Sardinian breccias have been referred to extinct species, such as *Arvicola brecciensis* (Giebel), *A. henseli*, F. Major, *Mus orthodon*, F. Major, *Lagomys sardus* (Hensel), *Talpa tyrrhenaica*, F. Major, and *Sorex similis*, F. Major. Moreover, as the dwarf extinct Elephants and Hippopotami of Malta, Sicily, and Crete, which clearly indicate African affinities in the Pleistocene Mammalian fauna of the Mediterranean islands, may eventually be discovered in Sardinia, it is a matter of considerable interest to determine whether the Pleistocene Avian fauna of the latter exhibits a similar proportion of extinct species, and likewise shows a marked African facies.

The more migratory habits of birds as compared with mammals preclude an exact comparison between the two groups, but the presence of an African species of *Bubo*, and also of a Roller, gives a certain African facies to the Sardinian fauna. With regard to the question of extinct species, the unfortunate imperfection of our English collections of recent avian skeletons (to which I have elsewhere had occasion to allude) renders it in some cases impossible to determine definitely the species to which the specimens belong. In all cases, however, in which I have been able to make specific determinations, I have not found characters to distinguish the fossil from existing forms. Here, however, it must be borne in mind that as many species of birds seem to differ from one another only by external characters, it is possible that if we had the fossil birds before us in the flesh points of difference might be detected which are not apparent from the bare bones.

Of the remains from the Tavolara cave the most abundant are those of Shearwaters and Quails; while next to these come those of Passerines. The abundance of the bones of Shearwaters and the entire absence of those of Gulls are circumstances very difficult of explanation. The specimens from Bastia are mostly referable to Passerines, more especially *Turdidæ*, but there is one humerus of a Pigeon and the terminal phalangeal of a large Accipitrine.

I. Striges.

Bubo, cf. cinerascens, Guérin.—Among the bones from Monte San Giovanni a small species of *Bubo* is represented by the distal part of the left tarso-metatarsus, the left femur, and the imperfect left metacarpus, all probably belonging to one individual. The tarso-metatarsus, as

[1] See Gervais, Zool. et Pal. Françaises, 2nd ed. p. 423.

the most characteristic bone, is represented in figs. 1, 1*a* of the Plate. The extremity of the outer trochlea is lost, but the specimen is sufficiently well preserved to show the high arch formed by the three trochleæ, as well as the backward direction of the inner one, by which the metatarsus of the Striges is so readily distinguished from that of the Accipitres. The femur has a length of 0,065. All these bones are much smaller than those of *B. ignavus*; and as they agree precisely with those of a skeleton of the South-African *B. maculosus* in the British Museum, I am disposed to refer them to the North-African *B. cinerascens* or *B. lacteus*, the former of which was at one time identified with *B. maculosus*[1]. Some terminal phalangeals of the foot from these deposits are probably referable to the same *Bubo*.

An imperfect left metacarpus from the Tavolara cave is slightly larger than the corresponding bone in the preceding series, although this difference in size may be merely sexual. It may be observed that the metacarpus of the Striges is very easily recognized by the presence of an incipient inter-metacarpal process, which attains its full development only in certain Passeres and most Gallinæ.

II. Accipitres.

Milvus, cf. ictinus, Savigny.—The somewhat worn and imperfect left tarso-metatarsus represented in figs. 2, 2*a* of the Plate is from Monte San Giovanni, and presents all the characters of the Accipitres as distinct from the Striges. It is indistinguishable from the corresponding bone of a recent skeleton of *M. ictinus* (*regalis*) in the British Museum, to which species the specimen may well belong, although I am unable to say definitely that it should not be referred to *M. migrans* (*ater*) or *M. ægyptiacus*. The tarso-metatarsus of *Circus* differs from that of *Milvus* by its much greater length; while those of *Buteo* and *Pernis* are distinguished by the different direction of the hinder process of the inner trochlea.

Aquila, sp.—The terminal phalangeal of the pes of a large Accipitrine, represented in fig. 3 of the Plate, was obtained from the breccia of Monte San Giovanni, Sardinia. From its length, slenderness, and high degree of curvature, it may be safely referred to the Eagles, as distinct from the Vultures, and may have belonged to the Golden Eagle. A phalangeal of similar type from the breccia of Toga, Corsica, may not improbably pertain to the same species.

Vultur, cf. monachus, Linn.—The imperfect hinder part of the cranium of a large Accipitrine from the breccia of Monte San Giovanni indicates a Vulture which appears inseparable form the existing *Vultur monachus*. As this specimen is not calculated to give a good figure, I have not had it drawn. This skull is distinguished from the largest species of *Aquila* not only by its superior dimensions, but also by its more depressed contour and the form of the temporal fossa. The narrow and highly vaulted skull of *Gyps* is even still more unlike the fossil. Compared, however, with a recent skull of

[1] See Blanford, 'Zoology of Abyssinia,' pp. 302, 303.

Vultur monachus in the British Museum, the Sardinian skull presents such a close resemblance that there can be little doubt that it belongs either to that species or to a closely allied form. I have already recorded[1] remains of *Vultur monachus* from the cavern of Bruniquel, in the Tarn-et-Garonne, France.

III. Picariæ.

Coracias, cf. abyssinica, Bodd.—The only Picarian remains in the collection comprise a few bones, apparently belonging to a single individual, from the Tavolara cave. These include the right coracoid, and the left femur, tibio-tarsus, and tarso-metatarsus. The two latter are represented in figs. 4, 4*a* of the Plate, while the coracoid is figured in woodcut 1.

The bones of Picariæ may readily be distinguished from those of Passeres (with which alone the smaller forms are at all likely to be confounded) by many features. Thus the humerus differs by the absence of the median tubercle on the distal part of the palmar aspect above the condyles. Again, the tibio-tarsus, as a general rule, is characterized by the very slight development of the crests at the proximal extremity, and has a very prominent tubercle on the anterior surface of the distal part of the shaft, some distance above the condyles. Moreover, the fibular ridge is very short and often low; while the distal condyles have a contour very different from that obtaining in the Passeres. The tarso-metatarsus is generally relatively shorter than in the latter, with a great distal expansion, and a distinct prominence on the inner border above the articular surface for the hallux; while the upper part of its anterior surface generally has a deep depression, with two foramina, dividing the three primary elements of the metatarsus. The distal trochleæ, which are wider than in the Passeres, are generally situated in the same vertical plane, and may or may not descend to the same horizontal line.

Such characters are presented by the bones before us. The tarso-metatarsus is characterized by its relative length and slenderness, by the presence of only a single closed tube in the talon (hypotarsus), and also by the circumstance that the three distal trochleæ descend nearly to the same level. In the latter respect it differs from the tarso-metatarsus of the Cuckoos and their allies, but agrees, as in the other points, with that of the Kingfishers, Bee-eaters, and Rollers. The tarso-metatarsus of the Kingfishers is distinguished by its shorter and stouter form, and also by the relatively higher position of the foramen between the third and fourth trochleæ; while that of the Bee-eaters is sufficiently distinguished by its smaller dimensions.

Compared with the corresponding bones of the Blue Roller (*Coracias garrula*), the tibio-tarsus and tarso-metatarsus agree so closely in structure in every respect that there can be no doubt that they indicate a bird of the same genus. There is, however, some discrepancy in size, as shown by the following measurements:—

[1] Cat. Foss. Birds Brit. Mus. p. 32 (1891).

	C. garrula.	Fossil.
Length of tibio-tarsus	0,044	0,043
,, of tarso-metatarsus ..	0,024	0,0225

These show that not only are the fossil bones rather smaller than those of *C. garrula*, but that in the former the tarso-metatarsus is shorter in proportion to the tibio-tarsus than in the latter. It appears that the two sexes of the Blue Roller do not differ in size, and it is therefore pretty evident that the fossil bones do not belong to that species. They may, however, be referable to the Abyssinian Roller (*C. abyssinica*), of which I have been unable to see a skeleton. That bird, of which only one specimen appears to have been recorded in Europe, is common in parts of Abyssinia and likewise occurs in Arabia. The fossils may, however, equally well have belonged to the N. African *C. pilosa*. The woodcut represents the coracoid of the Sardinian Roller.

Fig. 1.

Ventral aspect of right coracoid of *Coracias, cf. abyssinica*; from Tavolara. 1/1.

IV. Passeres.

Corvus corone, Linn.—Evidence of the presence of the Crow in the Sardinian Pleistocene fauna is afforded by the coracoid from Tavolara represented in fig. 5 of the Plate. This specimen, which belongs to the right side, accords in every respect with the corresponding bone of recent skeletons.

Fringillidæ.—Several species of *Fringillidæ* are indicated by humeri and other bones, but from their small size, and the large number of the existing species of these birds, the specific, and in some cases even the generic, determination is difficult. It may be observed that the humerus of this family is easily recognized by the great development of its tricipital fossa, which is separated from the subtrochanteric fossa merely by a thin septum of bone in its upper half, the lower portion of the two fossæ being confluent. In this respect the *Fringillidæ* differ widely from the *Corvidæ* (near to which they are usually placed), in which the tricipital fossa of the humerus is scarcely developed at all.

Of the specimens which can be more or less definitely recognized, we may first mention the right humerus from Tavolara represented in figs. 7, 7 *a* of the Plate. This agrees in all respects with the corresponding bone of a recent Hawfinch (*Coccothraustes vulgaris*), and may be confidently referred to that widely-spread European species. A right tibio-tarsus from the same locality is probably also referable to this bird. Three smaller humeri, from Monte San Giovanni, appear to be referable to the Bullfinch (*Pyrrhula europæa*), which now occurs in many parts of Italy, occasionally reaching as far south as Sicily. Three other humeri, of a more slender type, come very close to those of the Chaffinch (*Fringilla cœlebs*), although slightly larger than in existing examples; these bones are from Tavolara. Two considerably smaller humeri of a Finch from the same locality may prove to belong to the Serin (*Serinus hortulanus*), now so common in Italy.

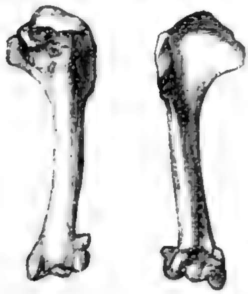
Alaudidæ.—The humerus of the Larks is readily distinguished from that of the Finches by the very slight development of the tricipital fossa, which forms a mere shallow depression quite distinct from the subtrochanteric fossa. Such a type of humerus is presented by the specimen of the right side from Monte San Giovanni represented in figs. 9, 9 *a* of the Plate. Since this bone is somewhat smaller than the humerus of *Alauda arvensis*, I think it not improbable that it may belong to *A. arborea*. A humerus from a breccia at Montmorency figured by A. Milne-Edwards, 'Rech. Oiseaux Foss. de la France,' pl. 156. figs. 22, 23, and referred to *A. cristata*, is of the size of that of *A. arvensis*, its characters being exactly those of the present example.

Sylviidæ.—Some small humeri in the collection not improbably indicate members of this family, although I have been unable to determine them even generically.

Turdidæ.—In this family the humerus is intermediate in character between that of the *Fringillidæ* and that of the *Alaudidæ*, having well-developed tricipital and subtrochanteric fossæ, separated from one another by a complete bony septum. These characters are shown in the right humerus from the breccia of Monte San Giovanni represented in figs. 8, 8*a* of the Plate. This specimen has a length of 0,0265, and is rather larger than the corresponding bone of *Monticola cyanus* figured in Milne-Edwards's 'Rech. Oiseaux Foss. de la France,' pl. 149. fig. 16. The left tibio-tarsal and tarso-metatarsus from Tavolara, represented in figs. 6, 6*a* of the Plate, may belong to the same kind of Thrush. The humerus differs from that of *Monticola cyanus* not only by its larger size but by the lesser development of the delto-pectoral crest. In the form of the latter, as well as in absolute size, it agrees so closely with the corresponding bone of *Turdus musicus* that it may be at least provisionally referred to that species.

A larger representative of the *Turdidæ* is represented by nine humeri and four other bones from the breccia of Toga, Corsica. The number of the humeri appears to indicate a gregarious species. One of these humeri, of the right side, is represented in woodcut 2, and has a length of 0,0295. Unfortunately I have had no opportunity of comparing this specimen with a humerus of *Turdus merula*. It is, however, rather smaller than one of *T. torquatus* belonging to a skeleton in the British Museum. Moreover, it agrees with that specimen in the slight degree of development of the oblique ridge on the outer surface of the delto-pectoral crest, in which respect it differs from the humerus of *Turdus* proper. I am therefore inclined to refer the

Fig. 2.



Dorsal and palmar aspects of the right humerus of *Turdus, cf. merula*, from Toga, Corsica. $\frac{1}{1}$.

specimen to the Meruline group, and think it highly probable that it belongs to *Turdus merula*.

Hirundinidæ.—The humerus of the Swallows is characterized by its relative shortness, and the development of a narrow and very shallow tricipital fossa extending slightly beneath the head. The specimen of the left side, from Monte San Giovanni, represented in figs. 10, 10 *a* of the Plate, indicates a member of this family, and is not improbably referable to *Hirundo rustica*. It is slightly narrower than the recent humerus of *Chelidon urbica* figured by Milne-Edwards in his 'Rech. Oiseaux Foss. de la France,' pl. 149. fig. 4, and still narrower than the fossil one of *Cotile rupestris* represented in plate 156. fig. 24 of the same work.

V. Columbæ.

Columba, cf. livia, Linn.—The only specimen in the Sardinian collection which can be referred to the *Columbidæ* is the coracoid from Tavolara represented in fig. 11 of the Plate. This specimen has lost the subclavicular process as well as the extremity of the hyosternal angle. It agrees so closely with the coracoid of *Columba livia* that I am disposed to refer it to that species, now common on both sides of the Mediterranean.

Among the specimens from the breccia of Toga, Corsica, is the right humerus of a Pigeon which may probably be referred to the same species as the Sardinian coracoid. The length of the specimen (fig. 3, p. 474) is 0,044; and it agrees very closely with the corresponding bone of a rather larger skeleton of *C. livia* in the British Museum.

VI. Gallinæ.

Coturnix communis, Bonnaterre.—As might have been expected from the abundance of the species at the present day on the Italian coasts, the remains of Quail are extremely common in Tavolara. The only specimen that I have thought it necessary to figure is the right tarso-metatarsus (represented in fig. 12 of Plate XXXVII.); but the collection comprises many specimens of this bone, as well as some of the tibio-tarsus, femur, coracoid, furcula, humerus, &c. Remains of Quail have been recorded by Milne-Edwards (*t. c.* pl. 134. figs. 25, 56) from the ossiferous breccia of Montmorency (Seine-et-Oise).

Fig. 3.

Palmar aspect of the right humerus of *Columba, cf. livia*, from the breccia of Toga, Corsica. $\frac{1}{1}$.

VII. Tubinares.

Procellaria.—Perhaps no bird-bones are more easily recognized than those of the *Procellariidæ*; some of the most characteristic being the coracoid, the humerus, and the tibio-tarsus. The humerus is readily distinguished from that of the Gulls by the absence of any distinct tricipital fossa, while the tibio-tarsus is equally well characterized by the upward prolongation of its cnemial crest. Again, the wing-phalangeals lack the two fenestræ which are so especially distinctive of that bone in the Gaviæ.

The collection from the Tavolara caves comprises, as I have said, a large number of bones of *Puffinus* clearly referable to three distinct species. The want of skeletons of all the recent species of the genus, to which I have already alluded, precludes, however, the specific determination of more than two of these forms.

These three Shearwaters are represented by bones from nearly all parts of the skeleton, including the skull. The specimens of the skull are alone sufficient to indicate the presence of three species, and are important in showing that all three belong to the long-beaked genus *Puffinus* as distinct from the shorter-beaked *Fulmarus*. The bones selected as illustrations of the three species are, however, chiefly the humerus, tibio-tarsus, and tarso-metatarsus.

The largest species of *Puffinus* is indicated by the right humerus, represented in figs. 13, 13 *a* of Plate XXXVII., which has a total length of 0,115. The proximal end of another right humerus indicates a slightly larger bird; and there are likewise a perfect radius and ulna according in size with the humeri, while there are also examples of the metacarpus. The skull is indicated by the imperfect rostrum, and the hinder part of the left mandibular ramus. The other bones from Tavolara which I refer to this species include the right coracoid and two examples of the femur. There is also a femur probably referable to this species from Monte San Giovanni.

The figured humerus is slightly longer than the one of *P. cinereus*, Stephens, figured by Milne-Edwards in his 'Rech. Oiseaux de la France,' pl. 52. fig. 7; and since it agrees very closely with the corresponding bone of a skeleton of *P. fuliginosus*, I am inclined to refer it to that species, which now inhabits South Europe. The tibio-tarsus of that species has a comparatively short cnemial crest, like that of the specimen represented in fig. 14 of the Plate.

The second species of the genus is represented by the right tibio-tarsus and tarso-metatarsus, drawn in figs. 14, 14 *a* of Plate XXXVII., as well as by the rostrum and portions of the mandible, together probably with some bones not easy to distinguish from those of the third species. The tibio-tarsus is very considerably larger than that of *P. obscurus* (Milne-Edwards, *op. cit.* pl. 51. figs. 14, 15), so that these specimens could not possibly have belonged to the still larger *P. fuliginosus*. In the small relative height of the cnemial crest this type accords with *P. fuliginosus*, and also with that of *P. chlororhynchus*, Less., of Madagascar, &c., the latter being, however, considerably smaller than the specimen before us. The figured tarso-metatarsus accords fairly well in relative size with the tibio-tarsus (although there are some slightly smaller specimens of the opposite side agreeing still better in this respect), and calls for no special mention. The species to which these bones belonged may probably be regarded as one allied to *P. chlororhynchus*.

The third species of *Puffinus*, as typified by the tibio-tarsus and tarso-metatarsus represented in figs 16, 16 *a* of Plate XXXVII., is distinguished from the preceding not only by its inferior size, but also by the much greater length of the cnemial crest of the tibio-tarsus. To the same species may be referred the type of humerus represented in figs. 15, 15 *a* of the Plate, as well as a coracoid and several examples of the radius, ulna, and metacarpus. There are likewise several more or less imperfect specimens of the cranium and mandible belonging to this species.

The tibio-tarsus accords in all respects with the corresponding bone of a skeleton of *P. anglorum* preserved in the Prosector's room at the Society's Gardens; and I should have no hesitation in referring the fossil form to that species were there not some doubt whether the Mediterranean representative of this Shearwater does not form a distinct species (*P. yelkouan*, Acerbi[1]). There can, however, I think be no doubt but that the fossil belongs to one or other of these two forms.

[1] See Yarrell's 'British Birds,' ed. 4, vol. iv. pp. 25, 26.

I may observe that *P. tenuirostris*, Temm., of Japan &c., agrees with *P. anglorum* in the great length of the cnemial crest of the tibio-tarsus, and that *P. cinereus*[1] makes an approximation in this respect. In *P. fuliginosus* and *P. chlororhynchus*, however (as I have observed), the cnemial crest of the tibio-tarsus is of the short type of the specimen represented in fig. 14 of the Plate; and I would suggest that attention to the relative length of this crest may afford important aid in the specific determination of the Shearwaters.

DESCRIPTION OF PLATE XXXVII.

Figs. 1, 1 *a*. *Bubo, cf. cinerascens*, Guérin. Anterior and distal aspects of the distal half of the left tarso-metatarsus.

2, 2 *a*. *Milvus, cf. ictinus*, Savigny. Anterior and distal aspects of the left tarso-metatarsus.

3. *Aquila*, sp. Terminal phalangeal of the pes.

4, 4 *a*. *Coracias, cf. abyssinica*, Bodd. Anterior aspect of the left tibio-tarsus and tarso-metatarsus.

5. *Corvus corone*, Linn. Ventral aspect of the right coracoid.

6, 6 *a*. *Turdus musicus*, Linn. Anterior aspect of the left tibio-tarsus and tarso-metatarsus.

7, 7 *a*. *Coccothraustes vulgaris*, Pallas. Palmar and dorsal aspects of the right humerus.

8, 8 *a*. *Turdus, cf. musicus*, Linn. Palmar and dorsal aspects of the right humerus.

9, 9 *a*. *Alauda, cf. arborea*, Linn. Palmar and dorsal aspects of the right humerus.

10, 10 *a*. *Hirundo* (?) sp. Palmar and dorsal aspects of the left humerus.

11. *Columba, cf. livia*, Linn. Ventral aspect of the left coracoid.

12. *Coturnix communis*, Bonnaterre. Anterior aspect of the right tarso-metatarsus.

13, 13 *a*. *Puffinus fuliginosus*, Kuhl. Palmar and dorsal aspects of the right humerus.

14, 14 *a*. *Puffinus*, sp. 2. Anterior aspect of the right tibio-tarsus and tarso-metatarsus.

15, 15 *a*. *Puffinus, cf. anglorum*, Temminck. Palmar and dorsal aspects of the left humerus.

16, 16 *a*. *Puffinus, cf. anglorum*. Anterior aspect of the right tibio-tarsus and tarso-metatarsus.

All the specimens are represented of the natural size. Those in figures 1, 2, 3, 8, 9, and 10 are from the ossiferous breccia of Monte San Giovanni, near Iglesias, Sardinia; the others from a cave at Pietro Tampoia, Tavolara.

2. On Remains of a Large Stork from the Allier Miocene. By R. Lydekker, B.A.

[Received July 30, 1891.]

In his well-known work on the Fossil Birds of France, Prof. A. Milne-Edwards[2] described the remains of a Stork from the Lower

[1] See Milne-Edwards, *op. cit.* pl. 51. figs. 14, 15.
[2] Rech. Oiseaux Foss. de la France, vol. i. p. 460 (1867–68).

Miocene (Oligocene) of Allier under the name of *Pelargopsis magnus* (correctly *magna*). This species was of the approximate size of *Ciconia alba*; the genus being distinguished, among other characters, by certain features of the tarso-metatarsus, such as the larger relative size of the third trochlea, the narrower groove between the third and fourth trochleæ, and the higher position of the foramen in that groove. Again, the tibio-tarsus is more compressed at its distal extremity, and has no intercondylar tubercle near the bridge over the extensor tendons.

At the time of writing the British Museum 'Catalogue of Fossil Birds' I accepted the name *Pelargopsis*, having overlooked the circumstance that it is preoccupied by Gloger[1] for a genus of *Alcedinidæ*; I accordingly propose to replace this name by *Pelargodes*.

In another part of the work cited Milne-Edwards incidentally refers to a second Stork from Allier, under the name of *Argala arvernensis*. There is, however, no reference to the specimens on which this determination is based, and the name must accordingly be regarded as a MS. one; and the evidence for the existence of *Leptoptilus* (*Argala*) in these deposits is therefore at present unavailable.

In the 'British Museum Catalogue of Fossil Birds'[2] I described and figured the distal part of a tarso-metatarsus belonging to a Stork of somewhat larger size than *Pelargodes magnus* (as I will now call it), under the name of *Propelargus cayluxensis*, that specimen having been obtained from the Upper Eocene (Oligocene) Phosphorites of France. At the same time I recorded the distal extremity of a tibio-tarsus and the proximal end of a tarso-metatarsus from Allier which I thought might very probably belong to *Propelargus*, and possibly to the same species as the one from the Phosphorites. These specimens indicated birds of the approximate size of *Leptoptilus javanicus*, which is considerably larger than *Ciconia alba*.

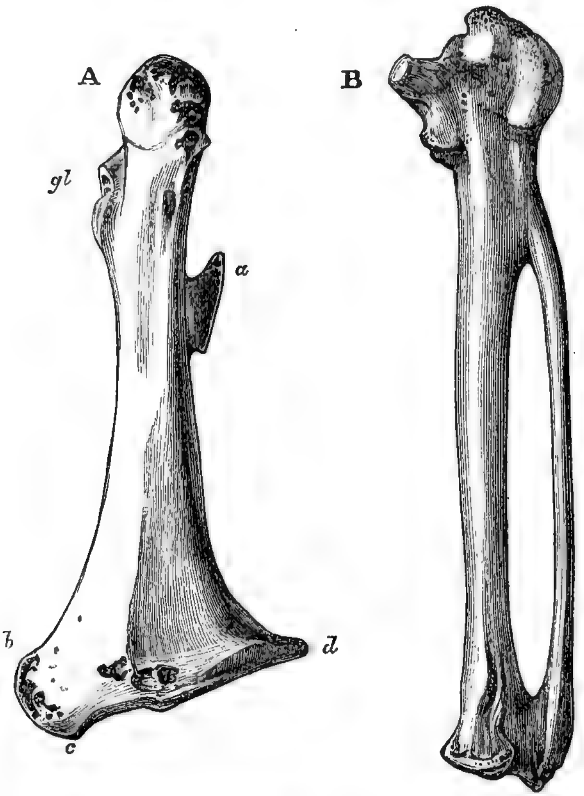
The foregoing summary epitomizes, I believe, our knowledge of the larger *Ciconiidæ* of the lower European Tertiaries. Recently Mr. A. Smith Woodward put into my hands the right coracoid and the left metacarpus of a large bird from the Lower Miocene of St. Gérand-Le-Puy, Allier, which had been recently obtained for the British Museum. These specimens, which apparently belonged to one individual, are represented in the drawing (p. 478). I at once recognized that they indicated a large Stork; and on comparing them with the corresponding bones of *Ciconia alba* found that they considerably exceeded that species in size.

The right coracoid, of which the ventral aspect is represented in figure A, agrees so closely in contour with the corresponding bone of *Ciconia alba*, that it appears impossible to find characters by which it can be generically distinguished. Its total length is 0,112,

[1] Handbuch d. Naturgeschichte, p. 338 (1842).
[2] Pages 65, 66.

against 0,092 in the recent bone. In its long and slender form, comparatively slight distal expansion, small and hook-like hyosternal process, and recurved and lamelliform subclavicular process without any perforation at its base, as well as in the rounded anterior surface of the shaft, the fossil coracoid exhibits all the distinctive characters of the *Ciconiidæ*.

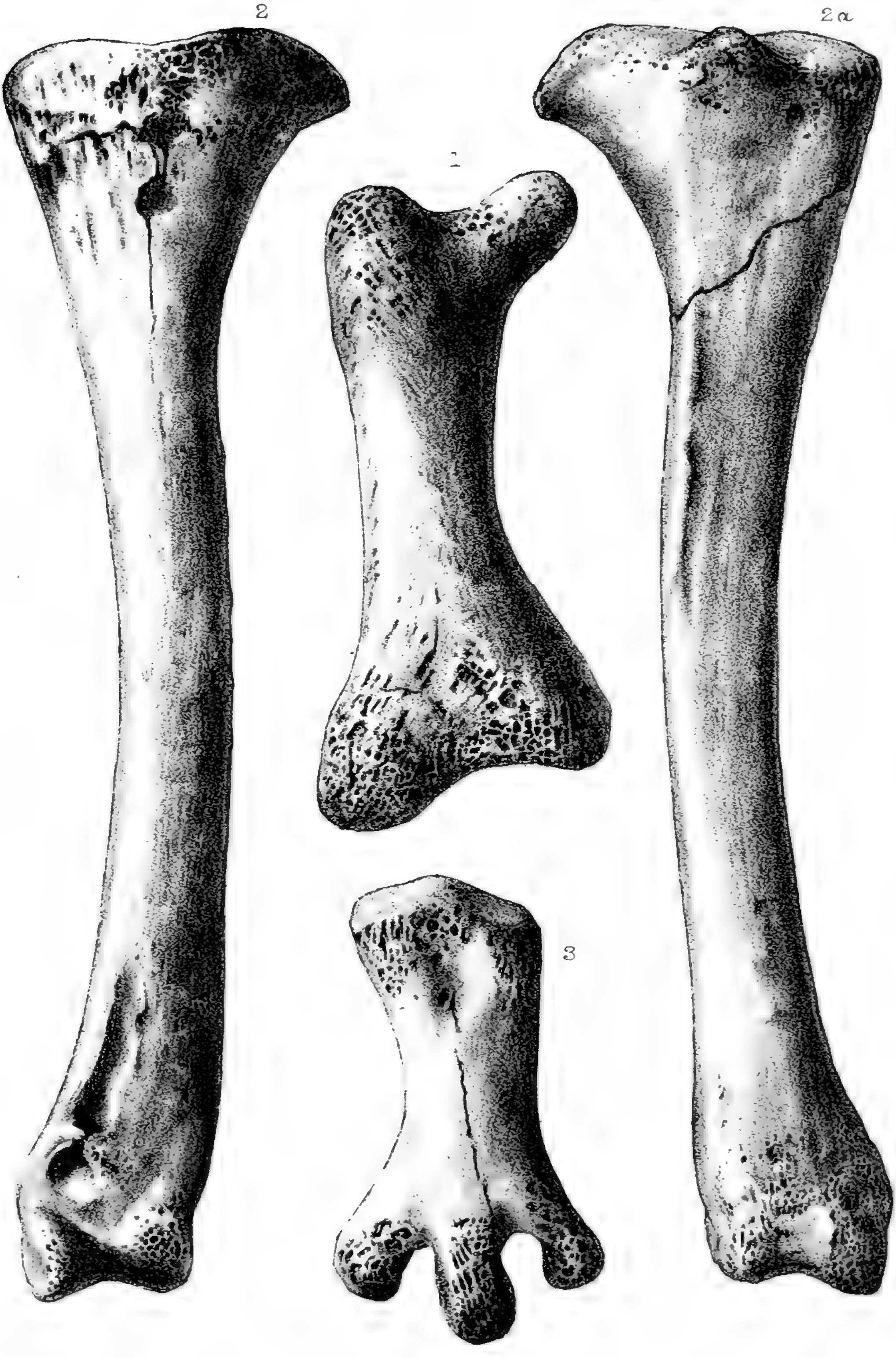
The metacarpus (B of figure) presents the same relative excess



Propelargus (?) *edwardsi.*—Ventral aspect of the right coracoid (A), and left metacarpus (B). *a*, subclavicular process; *b*, hyosternal process; *c*—*d*, sternal border. $\frac{2}{3}$.

over the corresponding bone of *Ciconia alba* as exists between the fossil and recent coracoids. It appears to agree in every essential point of contour with the metacarpus of the White Stork.

Had I these two bones alone to deal with, I should have been disposed to refer them to *Ciconia*; but since the above-mentioned leg-bones of Storks found in the Allier Miocene present generic differences from *Ciconia*, it is more probable that the specimens under consideration are likewise referable to an extinct genus,—the generic variations in the form of the coracoid and metacarpus being frequently less well marked than in the bones of the leg.



E. C. Woodward del. et lith. West, Newman imp.

Pachyornis rothschildi.

Since the present specimens are so much larger than the corresponding bones of *Ciconia alba*, it seems certain that they cannot be referred to *Pelargodes magnus*, which is of the approximate dimensions of the latter. Compared, however, with the leg-bones of the unnamed Stork from Allier, which agrees more nearly in size with the larger *Leptoptilus javanicus*, and is provisionally referred in the Museum Catalogue to the genus *Propelargus*, the fossils under consideration agree so well in relative size that there is every probability that they belong to the same species. In the Museum Catalogue I suggested that the Allier *Propelargus* might prove to be inseparable from *P. cayluxensis* of the Phosphorites, on which grounds I refrained from assigning to it a separate designation. There is, however, no proof of this specific identity; many of the Mammals of the Phosphorites being distinct from those of the Allier Miocene—a larger proportion being, indeed, identical with those of the Paris Basin. Under these circumstances I propose provisionally to regard the coracoid under consideration as the type of a new species to be tentatively assigned to the genus *Propelargus*, with the title of ***P.* (?) *edwardsi*.** Even if this should prove to be identical with Milne-Edwards's *Argala arvernensis*, my name will still stand. The specimens here described are not only of interest from their unusually fine state of preservation, but also as proving the existence at a period as early as the Lower Miocene of a Stork of the dimensions of the smaller species of *Leptoptilus*, and evidently very closely allied to genera still existing.

3. On a new Species of Moa. By R. Lydekker, B.A.

[Received August 13, 1891.]

(Plate XXXVIII.)

The large number of more or less well-defined species of Moas already recorded from the superficial deposits of New Zealand[1] might have been supposed to have included all the members of that group which existed in those islands during the later geological epochs. Among a collection of Moa-bones recently purchased by the Hon. L. W. Rothschild I have, however, found an associated series of specimens clearly indicating an undescribed species, although one which, in my opinion, should be referred to a genus already established. By the courtesy of their owner I am enabled to bring these specimens under the notice of the Society; and I am especially glad to do this, since nearly all the known species of the group have been first described in its publications.

The specimens in question comprise the right femur and the two tibio-tarsi and tarso-metatarsi. They are all much weathered, and

[1] In the 'Cat. Foss. Birds Brit. Mus.' (1891) 18 named species of *Dinornithidæ* are provisionally recognized, while four unnamed forms may indicate as many additional species.

have their ridges and extremities abraded, apparently indicating that they have lain exposed for a long period to the action of the weather on the surface of the ground. Unfortunately, there is no record of the locality where the specimens were obtained. There are, indeed, other bones in the collection belonging to the typical species of the genus *Pachyornis*, which is known only from the South Island, but since they are in a different mineralogical condition, and evidently from another locality, no inference can be drawn from them as to the present specimens. As there are many specimens in the British Museum from the North Island (and none from the South) in the same condition as the latter, it appears probable that these specimens may be also from the North Island.

The proportions of the tibio-tarsus and tarso-metatarsus show that the affinities of this Moa are with the genera *Anomalopteryx*, *Emeus*, and *Pachyornis*, and that it is quite distinct from *Dinornis*, in which the tarso-metatarsus is long and slender, and the tibio-tarsus is long and straight. The tibio-tarsus (Plate XXXVIII. figs. 2, 2 *a*) has a length of 22 inches and a distal width of 2·9 inches. These dimensions are alone sufficient to distinguish this specimen from the corresponding bone of all the species of *Anomalopteryx* and *Emeus*. Thus in *Emeus crassus*, which is the largest representative of either of those genera, the tibio-tarsus has a length of 20·4 inches and a distal width of 3·3 inches. The present tibio-tarsus is, however, at once distinguished from the corresponding bone of all the species of both those genera (with the exception of the small *Anomalopteryx* [?] *geranoides*, which probably indicates a distinct genus) by the outward curvature of the shaft and the marked inflection of its distal extremity.

In these respects the tibio-tarsus before us resembles the corresponding bone of the type species of the genus *Pachyornis*, from which it is, however, readily distinguished by its more slender proportions. Thus in the typical *P. elephantopus* the tibio-tarsus has a length of 24 inches, with a distal width of 4·2 inches; while in an unnamed form [1] which not improbably indicates a distinct species the two dimensions are 20 inches and 3·5 inches. These measurements indicate conclusively that the present tibio-tarsus (in which, as I have said, these dimensions are 22 inches and 2·9 inches) cannot be referred either to *P. elephantopus* or to the unnamed species. A comparison of the individual specimens would render this still more apparent, the present tibio-tarsus being a slender bone recalling the straight tibio-tarsus of *Dinornis*, while the corresponding bone of these species of *Pachyornis* is remarkable for its extremely stout and robust proportions.

We now come to the question whether the Moa represented by this slender type of inflected tibio-tarsus can be included in the genus *Pachyornis*; but before deciding this we must examine the other bones.

Firstly, with regard to the tarso-metatarsus, which is represented in Plate XXXVIII. fig. 3. Unfortunately the extremities of this

[1] Cat. Foss. Birds Brit. Mus. p. 318.

bone are so abraded that nothing can be gathered as to the contour of the trochleæ. Approximately, it has a length of 8·5 inches and a width at the middle of the shaft of 2·1 inches, while it measures about 5 inches across the distal trochleæ. In the tarso-metatarsus of *Pachyornis elephantopus* the corresponding dimensions are 9·4, 2·55, and 5·5 inches. The present specimen is therefore of a somewhat more slender type than the latter, but when complete appears to have had the distal trochleæ somewhat more expanded in comparison with the shaft and proximal extremity. There does not appear, however, to be any well-marked character by which it can be generically separated from *Pachyornis*. Compared with the typical species of that genus, somewhat more important differences are shown by the femur, of which the ventral aspect is represented in Plate XXXVIII. fig. 1. It may be observed that the femora of *Dinornis maximus* and *Pachyornis elephantopus* are contrasted in the Cat. Foss. Birds Brit. Mus. p. 223, fig. 57[1]; the former being characterized by its great length and slenderness and the small size of the popliteal depression, while the latter is distinguished by its shortness and stoutness and the large size of its popliteal depression, which communicates with the inner surface of the shaft by a more distinct channel, as well as by other features noticed in the work cited. Now the femur of the present bird, while agreeing with that of *Pachyornis elephantopus* in the contour and dimensions of the popliteal depression and in the form of the linea aspera, somewhat approximates in its general proportions to the corresponding bone of *Dinornis*, as is shown by the following dimensions :—

	Dinornis maximus.	New species.	*Pachyornis elephantopus.*
Total length of femur	15·6	10·6	12·5 in.
Distal width of femur	6·9	4·9	6·5 in.

The present type of femur is in fact more like the corresponding bone of *Anomalopteryx* and *Emeus*. On the other hand, the femur which I have provisionally referred[2] to *Pachyornis immanis* has proportions much more like those of the present specimen, having a length of 14·4 and a distal width of 6·1 inches. This type of femur seems, indeed, to make it impossible to separate generically the present form from *Pachyornis*, to which genus I propose to refer it provisionally under the name *P. rothschildi*.

In the work cited (p. 318) I have stated that the genus *Pachyornis* approaches *Anomalopteryx*, so far as cranial characters are concerned, much more nearly than it does to *Emeus*, and the present species serves to approximate *Pachyornis* in regard to slenderness of limb to the same genus, although the inflection of the lower end of the tibio-tarsus remains as well marked as in the type species. In the 'Catalogue' I had very great hesitation in referring the limb-bones mentioned under the name of *Anomalopteryx* (?) *geranoides* to the

[1] In the description of this figure the scale is given as $\frac{1}{3}$ instead of $\frac{1}{6}$.
[2] *Op. cit.* p. 344.

genus under which they are placed, since they exhibit the same inflection of the lower end of the tibio-tarsus characteristic of *Pachyornis*, and the present species now induces me to regard these specimens as probably indicating a very small form of *Pachyornis*. As mentioned above, the typical species of that genus, like *P. immanis*, is known only from the South Island; but since most of the bones described as *A.* (?) *geranoides* were obtained from the North Island, while there is a presumption that the remains of the present form may likewise have come from there, it looks as though it was in the North Island that the typical species of *Anomalopteryx* and *Pachyornis* were differentiated from a common ancestor.

EXPLANATION OF PLATE XXXVIII.

Bones of *Pachyornis rothschildi*; from the superficial deposits of New Zealand. $\frac{2}{7}$ nat. size.

Fig. 1. Back view of right femur.
2, 2 *a*. Front and back view of left tibio-tarsus.
3. Front view of left tarso-metatarsus.

4. Description of a remarkable Fish from Mauritius, belonging to the Genus *Scorpæna*. By Dr. A. Günther, V.P.Z.S.

[Received August 16, 1891.]

(Plate XXXIX.)

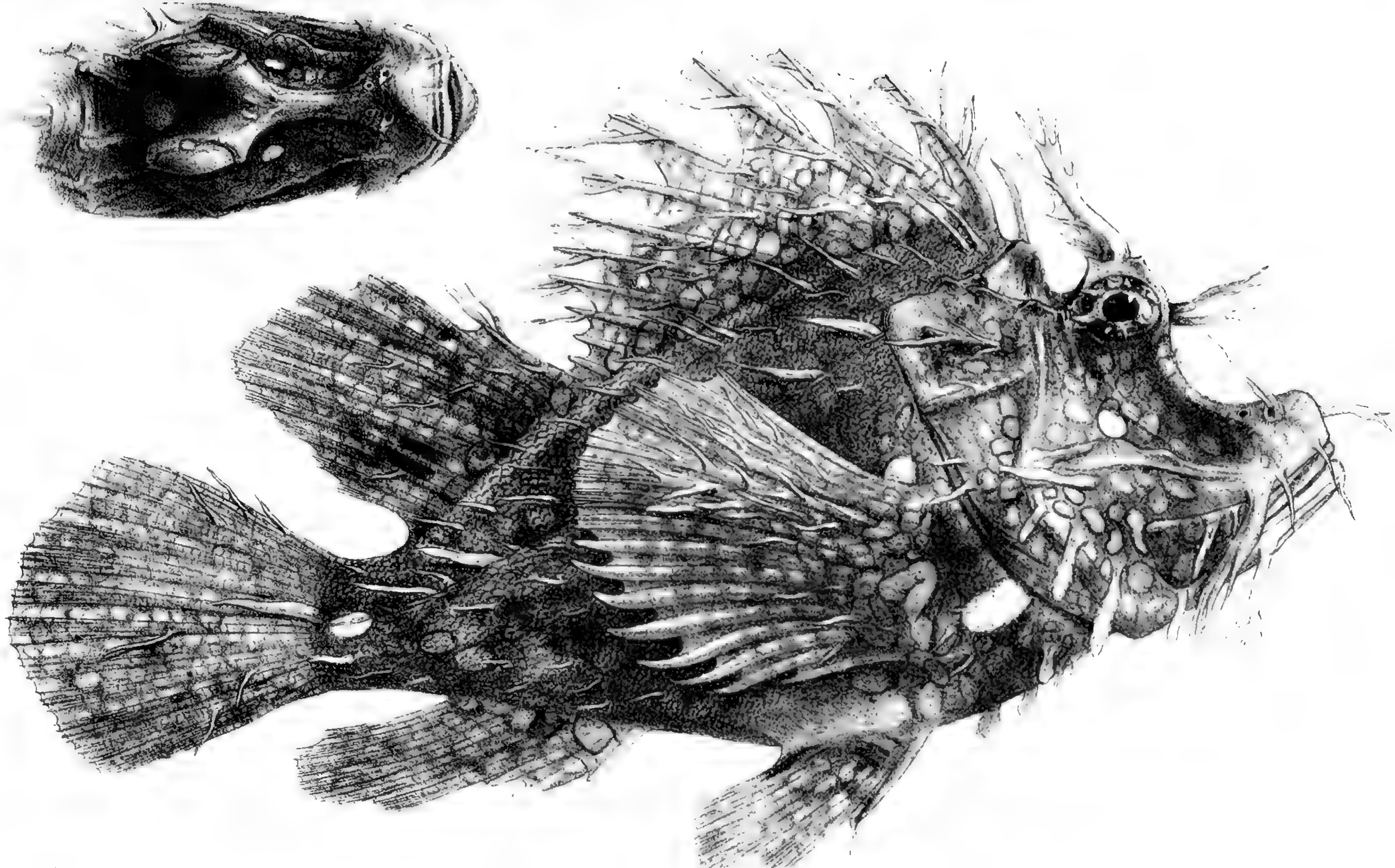
The subject of the following description formed part of a small consignment received from M. Robillard, of Port Louis, Mauritius. It differs very markedly in general appearance from typical *Scorpænæ*, but, in my opinion, too much weight should not be laid upon modifications of form in fishes which so readily adapt their outward appearance to their surroundings. The fish when at rest on the bottom must closely resemble a stone on which seaweed has begun to grow. It may be named

Scorpæna frondosa. (Plate XXXIX.)

D. 11. | $\frac{1}{9}$. A. $\frac{3}{5}$. P. 16. C. 16.

The head and body are much elevated and compressed, the depth being nearly one half of the total length without caudal fin; the small eyes are directed sidewards, but occupy a prominent position on the upper profile of the head, and are separated from each other by a deep concavity the width of which equals the diameter of the orbit. The upper profile of the nape as well as that of the snout is deeply concave, the latter being compressed into a sharpish ridge. The cheeks are hollowed out, the cavity being bordered below by the præorbital bone. A bony crest on each side of the occiput.

The mouth is wide, slightly oblique, the maxillary extending beyond the vertical from the front margin of the orbit. Jaws armed with a



R Mintern del et. lith.

Mintern Bros imp.

SCORPÆNA FRONDOSA.
(MAURITIUS.)

band of villiform teeth; a similar angular band on the vomer; no palatine teeth.

The dorsal fin commences on the foremost and highest part of the nape, and is composed of two portions which are connected at the base by a very low membrane. Both portions are very high. Of the spines the third and fourth are the longest, not quite one third of the total length without caudal; the longest rays are somewhat shorter. Anal fin about as deep as the soft dorsal. Caudal fin as long as the longest dorsal spine. Pectoral fin very large and broad, the seven lower rays being particularly stout and simple.

The body is covered with very small and indistinctly ctenoid scales; head and fins entirely naked. Nearly every part of the fish is covered with long fleshy tentacles, simple or fringed at the end; they are most numerous on the spinous dorsal and on the pectoral fins, but very few in number on the soft vertical fins. The largest are on the jaws, on the top of the orbital edge, along the præopercular margin, and along the lateral line. The eye itself is surrounded by a ring of small tentacles.

Ground-colour brownish, marbled with irregular round, greyish, brown-edged spots; a pure white round spot on the cheek, on the base of the pectoral fin, on the back of the peduncle of the tail, and on the end of the lateral line. A pair of oval black ocelli between the sixth, seventh, and eighth dorsal rays.

The total length of this fish is seven and a third inches.

5. On the Occurrence of a rare Fish (*Lophotes cepedianus*) at the Cape of Good Hope. By R. Trimen, F.Z.S.

[Received July 21, 1891.]

Specimens of *Lophotes* appear to be still of such rare occurrence that it may be of interest to record the capture of an example of *L. cepedianus* in False Bay on the 6th June, 1891.

This example was found on the sea-shore at a spot named Blue Dunes, about 5 miles east of Muizenberg, by some men in the employ of Mr. J. Hirsch, who has presented the fish to the South-African Museum. Mr. Hirsch was informed that it was alive when discovered; and its fresh condition when I received it at 1 o'clock (several hours after it was taken) lent much probability to this statement. The only injuries the specimen had sustained were the loss of the greater part of the caudal fin, and the fracture of some of the rays of the dorsal fin, including the long and strong first ray, but in the last-named the part snapped off (about two thirds of the total length) had been saved by the donor.

The specimen agrees very well with the figures given in Cuvier and Valenciennes's 'Hist. Nat. des Poissons' (pl. 301), and in the Atlas of the great illustrated edition of the 'Règne Animal' (Poissons, pl. 70), with the exception that there are no traces of the numerous rounded paler spots. This may perhaps be indicative of the immature fish, as the specimen now under notice is not more than three feet in length. It is also to be noted that the pectoral fins are silvery, and the anal and broken caudal fins silvery tinged with red; that the first ray of the dorsal fin, apparently complete, is acutely pointed, $5\frac{1}{2}$ inches in length, and but very slightly curved backward; and that the pupil of the eye is not round but oval longitudinally, as shown in the figures of *L. fiski*, Gthr. (Proc. Zool. Soc. 1890, pls. xix., xx.), but with a slight downward inclination anteriorly. The minute ventral fins are distinctly five-rayed. The depth of the body not far from the head is five inches and three-quarters, but its stoutest part in the same place, along the dorsal line, is rather less than half an inch in thickness.

Dr. Günther (*loc. cit.* p. 245) suggests that *L. capellei*, Schleg., and *L. cristatus*, Johns., may possibly be conspecific with *L. cepedianus*, and in that case the latter would be recorded as having occurred in the Mediterranean, off Madeira, and in the Japanese Sea; while its discovery now at the Cape of Good Hope will supply a further proof of its wide oceanic range. It is interesting to find both the type species of *Lophotes* and the very distinct *L. fiski* turning up in the same Bay within two years of each other.

South-African Museum, Cape Town,
30th June, 1891.

6. On a Specimen of *Pleurotomaria* from Tobago, West Indies. By R. J. Lechmere Guppy, C.M.Z.S.

[Received October 28, 1891.]

Among some shells placed in the Tobago Court at the Trinidad and Tobago Exhibition of 1890, my attention was soon drawn to a fine specimen of *Pleurotomaria*. On inquiry I found that the shell was the property of a gentleman of Tobago, off which island it had been obtained. The original owner having died, I was unable to obtain complete particulars respecting the acquisition of the shell, which after some negotiation became my property.

In an interesting paper by Henry Woodward, published in the 'Geological Magazine' for 1885, some particulars are given respecting the fossil and recent species of the genus, of which I avail myself. According to this author the number of fossil (extinct) species of *Pleurotomaria* is 1156, of which 226 are British. The genus was supposed to be entirely extinct until 1855, when the first living example was found by M. Beau off Mariegalante. This was described by Fischer and Bernardi in the 'Journal de Conchyliologie' for 1856 (p. 160, pl. v.) as *Pl. quoyana*. This specimen, 45 millimetres in height, was in 1873 purchased by Miss de Burgh, of London, for £25—a sum, as stated by the editors of the 'Journal de Conchyliologie,' rather below than above the real value of so rare a shell, of which, as stated by Woodward, only three examples are known up to the present time.

The next discovery of *Pleurotomaria* was in 1861, when a single imperfect specimen of another species came to light. This was described as *Pl. adansoniana* in the 'Journal de Conchyliologie' for that year (p. 163, pl. v.). This example was 80 millimetres in width and 74 in height. Another more perfect specimen of this species was taken near Guadelupe, and described in Journ. de Conch. 1882, p. 12, pl. i. This one was 85 millimetres in height and 91 in diameter.

It is to this species that the Tobago shell is to be referred. Besides the two examples named above, three others are known.

Two other living species of *Pleurotomaria* have been described—namely, *Pl. beyrichi* in 1877 and *Pl. rumphii* in 1879. The former was found in Japanese waters, and of it four examples are known. The latter is stated to be from the Moluccas, and only a single specimen is known. Consequently, according to the enumeration given in Woodward's paper, there were up to the present time thirteen specimens of recent *Pleurotomaria* in existence, belonging to four species. The Tobago specimen is therefore the sixth of the species and the fourteenth of the genus known as recent.

The dimensions of *Pl. quoyana* and *Pl. adansoniana* have already been given: those of the other two species are indicated below:—

	Height.	Diameter.
Pl. rumphii	170 mm.	190 mm.
Pl. beyrichi	82 „	83 „

The dimensions of the present specimen of *Pl. adansoniana* are as follows:—Total height 150 mm.; greatest diameter 160 mm.; height of aperture 50 mm.; width of umbilicus 30 mm.; length of fissure 220 mm.; width of fissure 5 mm. This, therefore, is the second in size of the specimens of recent *Pleurotomaria* in existence, being, in fact, very nearly as large as the unique specimen of *Pl. rumphii*, and leaving all the other known examples of the genus a long way behind. The coloration consists of a number of flames or irregular more or less zigzag spots of flesh-red passing into orange, arranged on a ground of very pale flesh tint. The apex is finely pointed, yellow, and almost smooth. When viewed through the funnel-shaped umbilicus and held to the light, it appears almost transparent. The supramedian fissure occupies the larger half of the contour of the shell. The characters generally correspond very closely with those given in the 'Journal de Conchyliologie,' 1882, p. 12. The colour of our specimen would appear, if we may judge by the figures, to be paler than the previous examples. It is in almost perfect condition, and looks as if when found it had had the soft parts in place. It is merely slightly house-worn, as an article which had been kept as a drawing-room ornament for several years would be.

As has been noticed, the habitat of *Pleurotomaria* is in deep water on rocky bottoms. Consequently it is probable that recent shells of this genus will always be rare; for not only is it difficult to procure shells living in such conditions, but the conditions themselves are of very restricted occurrence.

November 17, 1891.

Prof. Flower, C.B., LL.D., F.R.S., President, in the Chair.

The Secretary read the following report on the additions to the Society's Menagerie during the month of October 1891:—

The registered additions to the Society's Menagerie during the month of October were 120 in number. Of these 85 were acquired by presentation, 12 by purchase, 10 on deposit, 12 by birth, and 1 by exchange. The total number of departures during the same period, by death and removals, was 83.

The most noticeable additions during the month were:—

A young Buffon's Skua (*Stercorarius parasiticus*), captured near Christchurch, Hampshire, and presented by Mr. E. Hart, F.Z.S. This species is new to our list.

A Land-Crab (*Geocarcinus ruricola*) from the Island of Fernando de Noronha, brought home and presented by Mr. D. Wilson-Barker, F.Z.S.

A letter was read from Dr. G. Martorelli, Secretary of the Italian Society of Natural Sciences, Milan, enclosing a coloured drawing of both sexes of a hybrid Duck, bred in the public garden of Milan, between a male *Branta rufina* and a female *Anas boschas* two years ago. Six young ones were hatched, 3 male and 3 female.

A communication was read from Mr. H. Nevill, F.Z.S., urging the importance of founding an experimental Zoological Station in the Tropics, and advocating the claims of Trincomalee in Ceylon for such an Institution.

The following papers were read:—

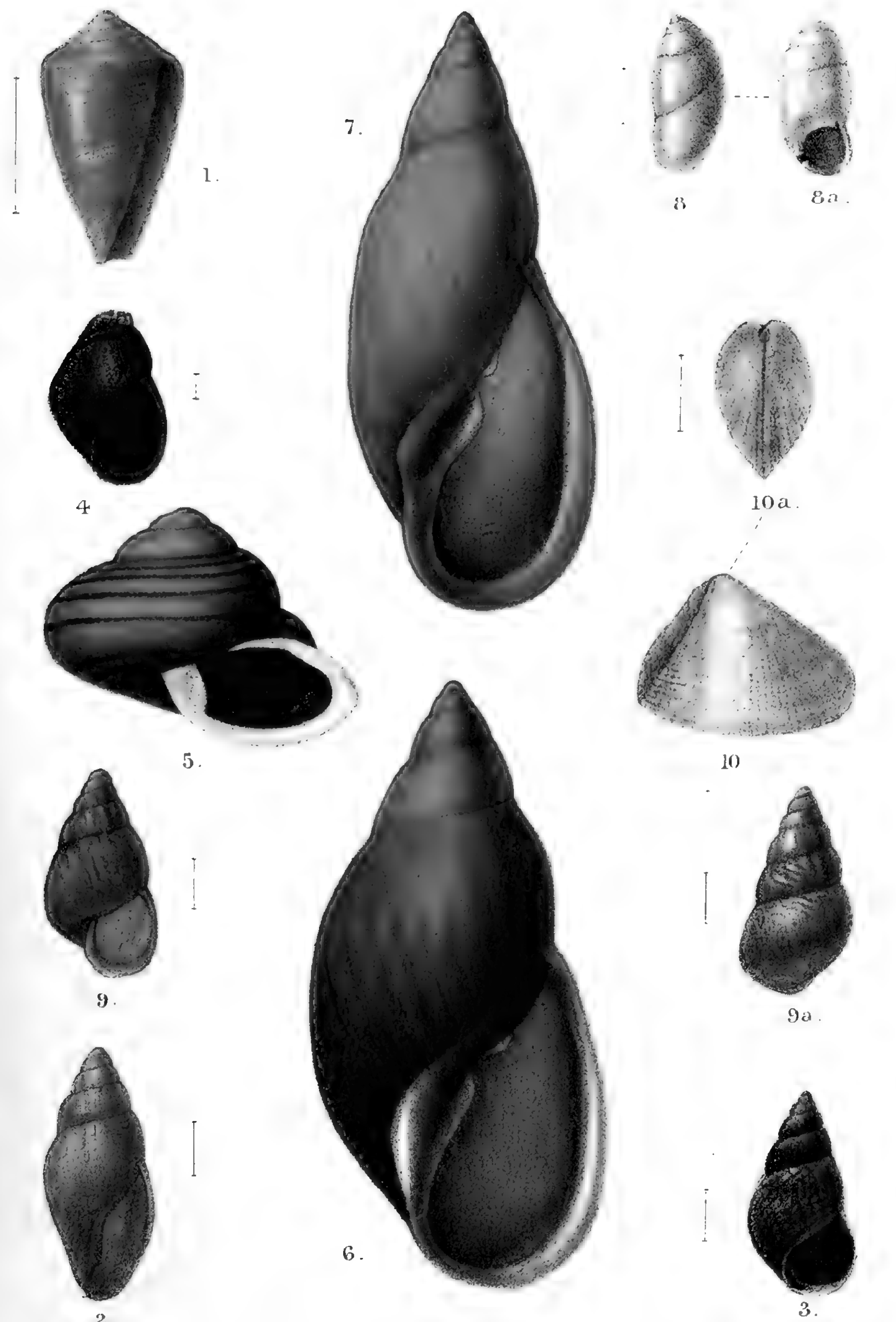
1. Descriptions of new Species of Shells from New South Wales, New Guinea, the Caroline and Solomon Islands. By Edgar A. Smith, F.Z.S.

[Received October 6, 1891.]

(Plate XL.)

The following species are based upon specimens which form part of a very valuable donation of shells from various localities, presented to the British Museum by Mr. John Brazier of Sydney, by whom the National Collection has over and over again been enriched with very many new and interesting forms of Mollusca and other branches of Zoology.

Most of the specimens have been collected by Mr. Brazier himself, and consequently are accompanied by precise information respecting their localities.



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NEW SPECIES OF SHELLS FROM AUSTRALIA, NEW GUINEA & THE CAROLINE & SOLOMON ISLANDS.

CONUS INNOTABILIS. (Plate XL. fig. 1.)

Testa parva, albida, flammulis longitudinalibus irregularibus fuscis vel rufescentibus picta, transversim anguste sulcata, sulcis longitudinaliter striatis, subpunctatis, quam interstitiis planis longe angustioribus; spira breviter conica rufo maculata; anfractus declives, plani, sulcis spiralibus tribus sculpti, sutura subcanaliculata sejuncti, ultimus superne obtuse angulatus, infra angulum lateribus levissime convexis, antice subconstrictus; apertura angusta, sordide albida vel pallide fuscescens.

Longit. 18 *millim., diam.* 10.

Hab. Rocky Point, four miles north of Richmond River, N. S. Wales; also Port Stephens near Sydney (*Brazier*).

This is an insignificant-looking species without any very marked features. The coloration is indefinite, but the spiral sculpture is well-marked. The sulci are scarcely half as wide as the spaces between them, which are flattened, and about twenty-four in number on the body-whorl.

MITROMORPHA BRAZIERI. (Plate XL. fig. 2.)

Testa ovato-fusiformis, spiraliter tenui-striata, lineis incrementi sculpta, pallide fuscescens, lineis transversis albo et rufo articulatis indistinctis, picta; anfractus 5, supremi duo (nucleus) magni, globosi, læves, nitidi, cornei, cæteri convexiusculi, sutura distincta leviter obliqua sejuncti, ultimus elongatus, antice parum contractus; apertura elongata, intus pallide fuscescens, antice late canaliculata, longit. totius $\frac{1}{2}$ *superans; labrum tenue; columella superne leviter concava, infra oblique torta, callo tenui nitente induta.*

Longit. $6\frac{1}{2}$ *millim., diam.* 3*; apertura* $3\frac{1}{3}$ *longa,* $1\frac{1}{4}$ *lata.*

Hab. Off Green Point, Watson Bay, Port Jackson, in 8 fathoms, on a bottom of broken shells, sand, and small stones (*Brazier*).

From the large size of the nucleus of this shell it was thought that possibly it might be the young state of some largish species. However, none were found with which it could be satisfactorily identified. The most distinguishing feature is the broad open anterior canal and the oblique lower portion of the columella.

I have placed it temporarily in the genus *Mitromorpha*, as it has spiral sculpture, the anterior canal, and the general form of that group of *Pleurotomidæ*. The operculum is unguiculate, and nearly two thirds as long as the aperture.

LITTORINA ACUTISPIRA. (Plate XL. fig. 3.)

Testa parva, elongata, superne acuminata, saturate grisea, infra suturam et circa basim anfract. ultimi flavescens, undique rufo vel fusco alboque punctulata; anfractus 7, leviter convexi, striis paucis spiralibus lineisque incrementi obliquis sculpti, ultimus interdum infra suturam obsolete constrictus; apertura late pyriformis, longit. totius $\frac{1}{2}$ *plerumque haud æquans, intus nigro-castanea, ad labium tenuiter luteo-marginata, zona* *basali lutea ornata; columella late expansa, obliqua, nigrescens.*

Longit. 7 *millim., diam. maj.* $3\frac{1}{2}$; *apertura* 3 *longa*, $2\frac{1}{4}$ *lata*.

Hab. Common in rock-pools at Green Point, Watson Bay, Port Jackson, N. S. Wales; also Parsley Bay, Port Jackson (*Brazier*).

Although of small size, the specimens described are evidently adult. The species is remarkable for its produced acuminate spire, the deep chestnut aperture bordered with a yellow outer lip, the almost black columella, and the red and white punctate character of the markings. This spotting is hardly visible to the naked eye, and excepting under a lens the shell has a general dark slaty appearance, yellowish at the suture and the base of the body-whorl.

LITTORINA INFANS. (Plate XL. fig. 4.)

Testa minuta, ovata, superne acuminata, ad apicem sæpe erosa, nigrescens, circa basim zona pallida albo rufoque notata ornata; anfractus 5, *convexiusculi, striis incrementi tenuibus sculpti, ultimus ad medium subangulatus; apertura nigrescens, zona basali pallida ornata, longit. totius* $\frac{1}{2}$ *adæquans, ovata, superne acuminata, antice effusa; peristoma tenue, marginibus callo tenui junctis, columellari expanso, nigro.*

Longit. $3\frac{1}{2}$ *millim., diam.* $2\frac{1}{3}$; *apertura* $1\frac{2}{3}$ *longa*, $1\frac{1}{4}$ *lata*.

Hab. Green Point, Watson Bay, Port Jackson. Found in rock-pools washed by ordinary high tides (*Brazier*).

This minute species like the preceding also appears to be adult. It is generally almost black, excepting the basal spotted zone, but occasionally specimens occur which are also more or less tessellated above.

HELIX (PAPUINA) AGNOCHEILUS[1]. (Plate XL. fig. 5.)

Testa semiobtecte umbilicata, depresse turbinata, solidiuscula, lineis incrementi oblique flexuosis conspicue lirato-striata, sub epidermide flavo-olivacea nitida albida, zonis pluribus (interdum obsoletis) nigrescentibus cincta; spira late conoidea, ad apicem fusco-nigrescentem haud acuminata; anfractus $4\frac{1}{2}$, *celeriter crescentes, convexi, infra suturam linea nigrescente marginati, ultimus in medio acute rotundatus, antice valde descendens; apertura transversa, obliqua, intus alba, lilaceo-fuscescens vel nigrescens callo tenui opalescente obscurata; peristoma niveum, late expansum et reflexum, marginibus conniventibus, callo tenui junctis, columellari intus inferne truncato, supra umbilicum late dilatato et reflexo.*

Diam. maj. 42 *millim., min.* 33, *alt.* 34; *apertura cum labro* $21\frac{1}{2}$ *longa*, 25 *lata*.

Hab. Douglas River, British New Guinea.

This species is remarkable for the broad snow-white lip, the truncate columella, and the very strong thread-like lines of growth. It is variable in colour, sometimes being conspicuously banded or

[1] ἁγνὸς, pure; χεῖλος, lip.

entirely without bands excepting that at the suture. The bands do not extend quite to the outer lip, but stop short about 4 millims. from the margin. Three of the four specimens examined have a shallow concentric depression or furrow around the middle of the base of the body-whorl; but this is not an essential characteristic, as there is not the slightest trace of it in the fourth shell.

H. tomasinelliana of Tapparone-Canefri is very like this species in many respects, but is different in form, being higher in proportion to the width and with a flatter base.

PLACOSTYLUS GUPPYI. (Plate XL. fig. 6.)

Testa rimata, elongato-ovata, superne acuminata, solidiuscula, rufescens, epidermide fusca, superne plus minus detrita, induta, longitudinaliter rugose striata, interdum in anfractu ultimo obsolete malleata; anfract. 5–6, *celeriter accrescentes, supremi tres planiusculi vel vix convexi, penultimus convexiusculus, ultimus magis convexus, magnus, oblongus, infra suturam obliquam submarginatus, leviter corrugato-plicatus; apertura inverse auriformis, longit. totius* ½ *superans, longe intus pallide rufescens, labrum versus saturatior; peristoma incrassatum, leviter expansum, rufescens, marginibus callo tenui albido junctis, columellari in regione umbilici late expanso, in apertura plicam albam validam formante; apertura tuberculo albo prominente supra plicam columellarem armata.*

Longit. 80 *millim., diam. maj.* 37; *apertura intus* 40 *longa,* 19 *lata.*

Hab. Solomon Islands.

Mr. Brazier does not know the particular island where this species is found. He possesses only five specimens of it, and of these he has most liberally placed two of the finest in the British Museum.

The species does not compare closely with any other form. It is rather ventricose, but less so than *Pl. eddystonensis*; but in other respects it is quite different. The epidermis is of a rich brown colour, here and there striped with a darker tint. The columellar fold and the tubercle above are strongly developed.

I have named this interesting species after Dr. H. B. Guppy, who has considerably advanced our knowledge of the fauna of the Solomon Islands.

PLACOSTYLUS CALUS[1]. (Plate XL. fig. 7.)

Testa elongata, perforata, superne rufescens, in anfr. ultimo pallidior, epidermide flavo-olivacea tenui induta, incrementi lineis tenuibus striata, sub lente microscopice et irregulariter transversim striata; anfractus 6, *celeriter crescentes, supremi parum convexi, ultimus elongatus, magnus, perobliqne descendens, ad sinistram peculiariter inflatus vel gibbus;*

[1] From καλός, beautiful.

apertura elongata, inverse auriformis, longit. totius $\frac{3}{5}$ adæquans, intus sordide albida, labrum versus fuscescens aut rufescens, dente parietali albo valido munita; plica columellaris valde prominens, alba; labrum expansum, subreflexum, carneo-rufescens, marginibus callo tenui junctis, columellari magis reflexo, umbilicum semiobtegente.

Longit. 78 *millim., diam. maj.* 33; *apertura intus* 44 *longa,* $14\frac{1}{2}$ *lata.*

Hab. Solomon Islands.

This species is about the size and general form of *Pl. macfarlandi* of Brazier, but differs in having the body-whorl a little longer in proportion to the spire, and the aperture is also more elongate, and the peristome is fleshy red and more expanded. It is more elongated than *Pl. macgillivrayi*, Pfeiffer, and has a less acuminate spire, but it agrees with it in the character of the columellar fold and the tubercle above it on the body-whorl.

PUPINA BRENCHLEYI. (Plate XL. figs. 8, 8 *a*.)

Testa pupiformis, pallide fulva, nitidissima; anfract. $5\frac{1}{2}$, *convexiusculi, celeriter crescentes, infra suturam linea pellucida angusta marginati, ultimus antice peroblique descendens, ad labrum subito brevissime ascendens, supra aperturam subplanulatus; apertura fere circularis, longit. totius* $\frac{1}{3}$ *paulo superans; labrum pallidum, antice subeffusum; incisura columellaris angusta, parva; dens parietalis acutus, labro sinu angusto sejunctus.*

Longit. 7 *millim., diam.* $3\frac{1}{2}$; *apertura* $2\frac{1}{4}$ *longa,* 2 *lata.*

Hab. Lugunor Island, Mortlock group of the Caroline Islands.

This species was found by Mr. Brazier in very great profusion in thick dense bush near the sea-beach under old cocoanut husks, leaves, and decayed wood on very wet or damp ground.

This species is very like *P.* (*Registoma*) *complanata* of Pease, but differs in having the body-whorl a little flatter above the aperture, the parietal tooth and notch are more distinct, and the columellar slit is smaller and not so deep. Out of seventy specimens examined, two have the parietal notch entirely filled up with callus, and in others it is partially obliterated.

The name proposed by Mr. Brazier may be retained in remembrance of Mr. Julius Brenchley, whose liberality and kindly disposition were greatly valued by many friends.

OMPHALOTROPIS CAROLINENSIS. (Plate XL. figs. 9, 9 *a*.)

Testa ovato-fusiformis, superne acuminata, anguste umbilicata, pallide cornea vel rufescens, plus minus opaco-albo lineata et maculata; anfractus 6, *convexi, lineis incrementi tenuibus striisque spiralibus tenuissimis obsoletis sculpti, sutura subprofunda vix obliqua sejuncti, ultimus rotundatus, infra medium plerumque haud maculatus, circa umbilicum carina obtusa instructus; spira conica, ad apicem subacuta; apertura ovata, superne leviter acuminata, antice ad carinam subeffusa, longit.*

totius $\frac{3}{7}$ adæquans; peristoma tenue, marginibus callo tenui junctis, exteriore simplice, columellari anguste reflexo.

Longit. 7 *millim., diam. maj.* $3\frac{2}{3}$; *apertura* 3 *longa*, 2 *lata.*

Hab. Lugunor Island, Mortlock group of the Caroline Islands, also at Iris Island of the Rouk group (*Brazier*).

The reddish specimens, which are well marked with wavy lines and blotches of opaque white, are extremely pretty. Some specimens are almost entirely devoid of markings, being of a uniform pale horn colour, and when this painting is present it is invariably less conspicuous on the lower part of the body-whorl than above. The spiral striæ referred to in the preceding diagnosis are very feeble and only noticeable under a powerful lens.

Donax brazieri. (Plate XL. figs. 10, 10 *a*.)

Testa trigona, antice anguste rotundata, postice et superne angulata, valde inæquilateralis, albida vel grisea, umbones versus interdum livida vel lilacea, obsolete biradiata; area valvarum antica polita, radiatim tenuiter striata et prope angulum posticum subacutum concentrice rugose striata, postica carina circumscripta, radiatim tenuiter lirata, lirisque transversis leviter flexuosis granose cancellata; pagina interna polita, margine inferiore (interdum quoque postico) crenulato, lilaceo-fusca, albida vel fuscescens, versus marginem pallida, radiatim tenuiter substriata; linea pallii profunde et late sinuata.

Longit. 13 *millim., alt.* 10, *diam.* 6.

Hab. Rocky Point, four miles north of Richmond River, New South Wales.

Mr. Brazier observes respecting this species:—"I have never found this alive on any part of the coast, and suppose it to be a very deep-water species, as it is met with only after gales."

It is remarkably triangular, and occasionally almost quite equilateral. The posterior area of the valves is not glossy like the anterior and much more strongly sculptured. This coarser sculpture, however, just passes over the sharp angle which separates the two areas. The colour is variable both externally and within; but usually it is pale, with an indication of two broad rays, one near the angle and the other more towards the front. I have much pleasure in associating this pretty species with the name of its discoverer.

EXPLANATION OF PLATE XL.

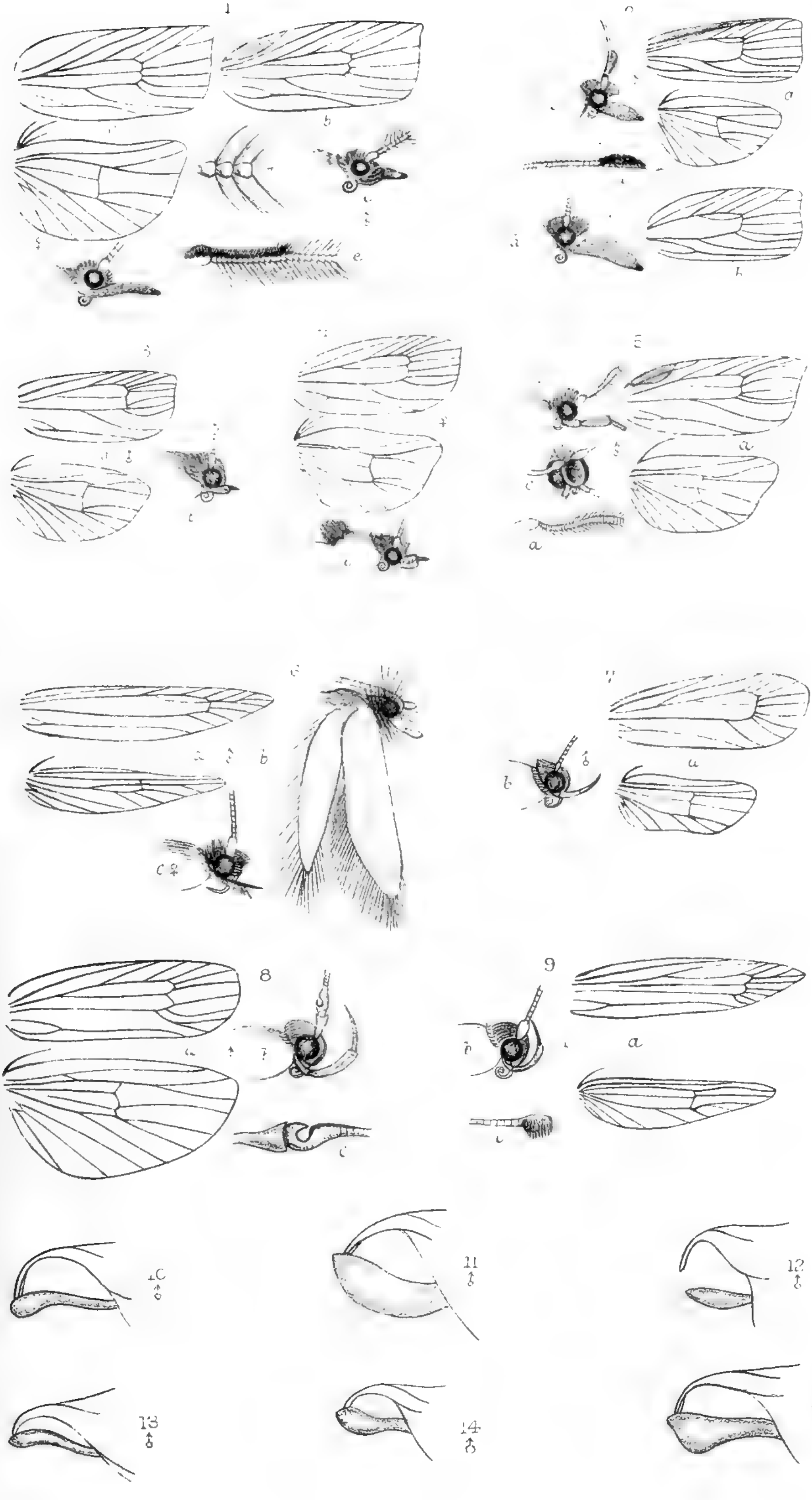
Fig. 1. *Conus innotabilis*, p. 487.
2. *Mitromorpha brazieri*, p. 487.
3. *Littorina acutispira*, p. 487.
4. *Littorina infans*, p. 488.
5. *Helix (Papuina) agnocheilus*, p. 488.
6. *Placostylus guppyi*, p. 489.
7. *Placostylus calus*, p. 489.
8, 8 *a*. *Pupina brenchleyi*, p. 490.
9, 9 *a*. *Omphalotropis carolinensis*, p. 490.
10, 10 *a*. *Donax brazieri*, p. 491.

2. On the Micro-Lepidoptera of the West Indies. By the Rt. Hon. Lord Walsingham, M.A., LL.D., F.R.S., &c.

[Received November 17, 1891.]

(Plate XLI.)

This paper is founded upon a collection of Micro-Lepidoptera made by Herbert H. Smith in the Island of St. Vincent, and placed in my hands by Mr. F. DuCane Godman. In order to identify the species it was necessary to study carefully all the descriptions of West-Indian forms which might probably be found among them. It is possible that some may yet have been overlooked, as they are scattered through a mass of periodical publications in at least three languages. Having so far made myself acquainted with the literature of the subject, it seemed desirable to supply such information as would facilitate a study of the geographical distribution, and with this view a tabulated index to all the West-Indian species is included in the paper. It has not been attempted to define or to follow any already defined faunistic West-Indian region; the term is used simply in its geographical sense, and includes the whole range of islands stretching from Yucatan to the coast of Venezuela. It would be interesting in this connection to obtain a representative collection from the peninsula of Florida and the adjacent islands, approaching, as they do, so nearly to the northern coast of Cuba, especially as the few species I have seen from that locality are remarkable, not only for their beauty and distinctness, but also for their evident alliance with the genera, and almost with the species, which have reached us from the mouth of the Amazons and from the northern portion of Brazil. It will be seen that, so far as our present knowledge extends, the Micro-Lepidoptera of these islands are somewhst highly specialized. Several new genera are described and others are mentioned which have not as yet been recognized elsewhere; but it must not be presumed that these will not ultimately be found to have a wider distribution. Had we been dealing with the Rhopalocera, or with any of the larger and more conspicuous Heterocera, a tabulated Index would have shown more nearly the true limitation of range in the different species; for these have been carefully collected and studied, and individual species are far less likely to have been overlooked than those of obscure and much neglected groups such as the *Tortricidæ*, *Tineidæ*, and *Pterophoridæ*. With the exception of three more or less cosmopolitan species, one of which, *Trichoptilus centetes*, Meyrick, seems out of place here (probably only because it has been described under other names from different parts of the world), the whole of the known West-Indian forms are decidedly American, ranging northward to the Southern and Western portions of the United States, and southward as far at least as Brazil; the majority, however, certainly belong to the truly Central-American fauna. I must acknowledge my indebtedness to Dr. Staudinger for allowing me to see several of



J. H. Durrant del.
F. W. Frohawk lith.

West, Newman imp.

Micro-Lepidoptera of the West Indies.

Zeller's types, and to my friend Mr. Godman for placing this limited, but interesting and valuable collection in my hands. Mr. Druce has also kindly contributed several species from Dominica, and Mr. J. H. Hart has also been good enough to collect for me in Trinidad, and Mr. T. D. A. Cockerell in Jamaica.

PTEROPHORIDÆ.

AGDISTINÆ.

SCOPTONOMA, Z.

SCOPTONOMA TIPULOIDES, sp. n.

Antennæ pale cinereous.

Palpi whitish ochreous, streaked along the sides with black.

Head brownish above, with a dark brown triangle in front margined with whitish-ochreous lines passing from the base of the antennæ and meeting above the haustellum.

Thorax mottled with reddish brown, dark fuscous, and whitish ochreous.

Fore wings brownish, with numerous angulated whitish streaks, intermixed with dark fuscous streaks, lines, and shading; an oblique whitish line from the dorsal margin near the base terminates on the median vein at almost one third of the wing-length, this is preceded and followed by a few blackish scales, and the space within it has a somewhat longitudinally-striated appearance: from near the middle of the dorsal margin arises a second whitish oblique streak, angulated backwards about the middle of the wing, and thence again outwards along the median vein; throughout its length it is accompanied on its upper side by a narrow black line which is continued beyond it, first towards the anal angle and thence, after several deflexions, upwards to the apex and costal margin; this oblique double line forms the lower edge of two, almost connected, angular transparent rosy-white patches, the first extending from the submedian to the median vein, the second lying above the median, decidedly triangular, its base upon the lower edge of the cell, its apex reaching to the upper edge beyond the middle of the wing; the inner margins of these triangular patches being continuous, give them the appearance of one single oblique patch, but the ground-colour of the wing is carried through them very narrowly along the median vein; a dark fuscous or blackish shade clearly defines the inner and outer margins of the transparent patch, but the space below it is more tinged with brown than the apical portion of the wing beyond it, except along the costal and part of the apical margin: at two thirds from the base is a short semi-transparent streak dark-margined within, a little beyond which is a pale costal spot dark-margined on both sides: beyond this small costal spot we come to the other end of the black line (already described as arising from the dorsal margin before the middle in connexion with the pale streak below it); tracing it therefore, in the opposite direction, we find it arising at about one-sixth from the apex, running very obliquely outwards nearly to the depressed apex itself, thence back at a very acute angle to a point opposite its origin, whence it is curved downwards and outwards towards the middle of the apical margin, with which it runs parallel until again curved above the anal angle, whence it can be traced to the triangular semi-transparent patch (up to which its course has already been described); the black line is margined on both sides with whitish-ochreous lines above the middle of the apical margin, and a short line of the same colour extends along the upper half of the margin to the apex, there is also a short streak above the anal angle; cilia whitish, with much dark fuscous mottling, especially at the apex, at the middle, and at the anal angle, but with a dark line running throughout them near the base. The markings to a great extent show through on the underside.

Hind wings semi-transparent, pale rosy æneous; the apex and outer half of the dorsal margin banded with blackish, as is also the costal margin; with three blackish spots, one below the middle of the costal band, one below the middle of the wing, and one at the abdominal angle (these are inconspicuous in specimens in less good condition); a slender whitish line runs parallel with the dorsal margin throughout the wing-length; cilia pale cinereous, with a dark line running through their middle. The markings to a great extent show through on the underside.

Abdomen whitish ochreous, mottled above with reddish brown mixed with dark fuscous; some slight lateral tufts along the segments are also of this mixed colour.

Legs pale whitish ochreous, unspotted.

Exp. al. 24 millim.

Hab. West Indies—Trinidad. (Port of Spain; 1 specimen received from Mr. J. H. Hart.)

Type, ♂ Mus. Wlsm.

I have also two specimens of this species from the Zeller Collection collected either by Baron von Nolcken or Petersen; but I have not been able to trace whether they were taken in the West Indies, Panama, or Colombia.

Pterophorinæ.

Trichoptilus, Wlsm.

Trichoptilus centetes, Meyr.

Trichoptilus centetes, Meyr. Tr. Ent. Soc. Lond. 1886, pp. 16, 17: 1887, p. 266.

[?=*Pterophorus oxydactylus,* Wkr. Cat. Lp. Ins. B. M. xxx. p. 944 (1864), Ceylon.]

New Guinea, Australia, (? Ceylon).

West Indies—St. Vincent (windward side, 3 specimens, *Smith*).

This species has apparently a wide distribution, and is very nearly allied to *Trichoptilus* (*Aciptilus*) *californicus*, Wlsm., from Northern California; it has, however, darker hind wings and less white upon the surface and cilia of the fore wings. Specimens from Mexico and

Arizona cannot be separated from *T. centetes*; but from their slightly paler colouring may perhaps be regarded as forming a connecting link between the Northern and Southern forms.

PLATYPTILIA, Hb.

PLATYPTILIA PUSILLIDACTYLA, Wkr.

Oxyptilus pusillidactylus, Wkr. Cat. Lp. Ins. B. M. xxx. p. 933 (1864).

N. syn.=*Platyptilia tecnidion*, Z. Hor. Soc. Ent. Ross. xiii. pp. 468–9, pl. vi. fig. 162 (1877).

Imago. February (*Z.*).

West Indies—Jamaica (*Wkr.*), St. Thomas (*Z.*).

PLATYPTILIA, sp., Snell.

Platyptilia, sp., Snell. Tijd. v. Ent. xxx. p. 66 (1887).

West Indies—Curaçao (*Snell.*).

STENOPTILIA, Hb.

STENOPTILIA ? PUMILIO, Z.

Mimeseoptilus pumilio, Z. Ver. z.-b. Ges. Wien, xxiii. p. 324 (1873).

United States.—Texas (*Z.*).

West Indies—St. Vincent (windward side, 2 specimens, *Smith*).

The slender erect palpi as well as the neuration appear to separate this species from *Mimeseoptilus*, Wlgrn. (=*Stenoptilia*, Hb.), the genus in which it was placed by Zeller. The same form occurs in other species from South America; but I prefer to study more material before coming to a decision upon its generic value.

ALUCITA, L.

ALUCITA THOMÆ, Z.

Leioptilus thomæ, Z. Hor. Soc. Ent. Ross. xiii. pp. 480–1, pl. vi. fig. 170 (1877).

Imago. December (*Z.*).

West Indies—St. Thomas (*Z.*).

ALUCITA BASALIS, Mschl.

Oedematophorus basalis, Mschl. Ab. Senck. Nat. Ges. xv. pp. 345–6, 354 (1890).

West Indies—Portorico (*Mschl.*).

ALUCITA PALEACEUS, Z.

Leioptilus paleaceus, Z. Ver. z.-b. Wien, xxiii. pp. 326–7 (1873).

Pterophorus paleaceus, Mschl. Ab. Senck. Nat. Ges. xv. pp. 346, 354 (1890).

United States.—Ohio (*Z.*), Texas (*Z.*).

West Indies—Portorico (*Mschl.*).

ALUCITA BIPUNCTATUS, Mschl.

Pterophorus bipunctatus, Mschl. Ab. Senck. Nat. Ges. xv. pp. 346, 354 (1890).

West Indies—Portorico (*Mschl.*).

ALUCITA PARTICIPATUS, Mschl.

Pterophorus participatus, Mschl. Ab. Senck. Nat. Ges. xv. pp. 346, 354 (1890).

West Indies—Portorico (*Mschl.*).

ALUCITA PRÆUSTUS, Mschl.

Pterophorus praeustus, Mschl. Ab. Senck. Nat. Ges. xv. pp. 346, 354 (1890).

West Indies—Portorico (*Mschl.*).

PTEROPHORUS, Geoffr.

PTEROPHORUS AGRAPHODACTYLUS, Wkr.

Pterophorus agraphodactylus, Wkr. Cat. Lp. Ins. B. M. xxx. p. 941 (1864).

West Indies—San Domingo (*Wkr.*).

PTEROPHORUS ASPILODACTYLUS, Wkr.

Pterophorus aspilodactylus, Wkr. Cat. Lp. Ins. B. M. xxx. pp. 941–42 (1864); Btl. P. Z. S. 1878, p. 495.

West Indies—Jamaica (*Wkr.*).

PTEROPHORUS, sp., Mschl.

Aciptilia, sp., Mschl. Ab. Senck. Nat. Ges. xv. p. 346 (1890).

West Indies—Portorico (*Mschl.*).

ORNEODINÆ.

ORNEODES, Latr.

ORNEODES EUDACTYLA, F. & R.

Alucita eudactyla, F. & R. Reise Nov., Lp. pl. cxl. fig. 62 (1875); Mschl. Ab. Senck. Nat. Ges. xv. pp. 346, 354 (1890).

Colombia, Brazil.

West Indies—Portorico (*Mschl.*).

TORTRICIDÆ.

TORTRICINÆ.

APINOGLOSSA, Mschl. & Saalm.

APINOGLOSSA COMBURANA, Mschl.

Apinoglossa comburana, Mschl. Ab. Senck. Nat. Ges. xv. pp. 331, 354 (1890).

West Indies—Portorico (*Mschl.*).

Cacœcia, Hb.

Cacœcia jamaicana, Wkr.

Teras jamaicana, Wkr. Cat. Lp. Ins. B. M. xxviii. p. 291 (1863).

West Indies—Jamaica (*Wkr.*).

This species was wrongly included in *Teras* by Walker; it should be transferred to *Cacœcia,* with which it agrees in structure.

Tortrix, L.

Tortrix ? effoetana, Mschl.

Tortrix effoetana, Mschl. Ab. Senck. Nat. Ges. xv. pp. 330, 354 (1890).

West Indies—Portorico (*Mschl.*).

Tortrix ? insignitana, Mschl.

Tortrix insignitana, Mschl. Ab. Senck. Nat. Ges. xv. pp. 330–31, 354 (1890).

West Indies—Portorico (*Mschl.*).

These two species being described from females, it is impossible to say whether they are rightly referred to the genus *Tortrix.*

Ptychamorbia, gen. n.

(πτύξ = a fold; *Amorbia,* nom. gen.)

Type, ♂ ♀ *Tortrix exustana,* Z. (Colombia). (Plate XLI. fig. 1, *a–f.*)

(*exustana,* Z., ♀ = *colubrana,* Z., ♂.)

Antennæ biciliate in the ♂, each ciliation formed of a group of several hairs, and with the first 14 and the basal joint thickened with a mat of scales above, somewhat lengthened at its abrupt termination; ♀ simple.

Palpi conical, densely clothed, apical joint moderate; projecting more than the length of the head beyond it in the ♂, twice the length of the head in the ♀.

Head moderately smooth; frontal scales projecting over the base of the palpi.

Thorax smooth.

Fore wings elongate, quadrate; costal margin arched before the middle, ♂ with a strong costal fold at the base; apex rectangular, apical margin slightly indented below the apex; dorsal margin slightly convex. *Neuration*: ♀ 12 veins; 7 and 8 with a long common stem, enclosing the apex: ♂ 11 veins (7 and 8 coincident).

Hind wings with the costal margin excavate before the apex in both sexes; apex rounded; apical and dorsal margins almost continuous, abdominal angle slightly dilated; ♀ with long hairs above at the base. *Neuration*: 8 veins; 3 and 4 from a point, 5 bent over to near base of 4.

Legs moderately clothed.

This genus partakes of the characters of *Amorbia*, Clem., and *Platynota*, Clem., resembling the first in the different neuration of the male and female, and the latter in the presence of a costal fold in the male. It is also allied to *Cerorrhineta*, Z., which agrees with *Platynota* in neuration, but differs in the structure of the antennæ and in the shape of the fold.

Zeller's type of *Tortrix* (*Œnectra*) *exustana* (♀) is before me, and it is unquestionably the female of *Tortrix colubrana*, Z., of which the type (♂) is also in my collection. Both specimens are from Colombia. The differences in the neuration apparently misled Zeller in supposing them to be distinct, and caused him to refer them to different genera.

PTYCHAMORBIA CATENANA, sp. n.

Antennæ (♀) with the basal joint somewhat enlarged, simple; dark reddish brown.

Palpi projecting more than the length of the head beyond it; second joint smooth, somewhat thickly clothed above; apical joint moderate, exposed; reddish brown.

Head and *thorax* reddish brown.

Fore wings (♀) much arched at the base, straight beyond, apex somewhat produced; apical margin indented, not oblique; anal angle rounded. *Neuration*: 12 veins, 7 and 8 from a long common stem, enclosing the apex. Tawny reddish-brown with a very ill-defined basal patch, wider on the dorsal than on the costal margin; an ill-defined fasciaform shade commencing at one third from the base on the costal margin runs obliquely outwards to the middle of the wing, thence depressed to the dorsal margin scarcely beyond the middle; on this fascia are some obscure grey metallic spots; the apical portion of the wing is of the same darker shade as the fascia and contains two curved lines of grey metallic spots, the first running parallel with the central fascia from beyond the middle of the costa to the anal angle, the second again parallel beyond it; the space between these and the apex is also studded with similar spots; cilia pale ochreous, with a tawy-brown line along their base. Underside unicolorous shining brownish ochreous.

Hind wings much excised on the costal margin before the apex. *Neuration*: 8 veins, 3 and 4 from a point, 5 bent over and nearly touching the base of 4. Brownish ochreous, the apex shaded with fuscous scales; cilia shining pale ochreous, with a brownish shade along their base. Underside unicolorous shining brownish ochreous.

Abdomen ochreous.

Legs ochreous; hind tarsal joints shaded with fuscous.

Exp. al. 20–28 millim.

Hab. West Indies—St. Vincent (windward side, 2 specimens, *Smith*).

Brazil—Espiritu Santo (*Schmidt*).

Type, ♀.

I have little doubt that the male of this species will be found to possess but 11 veins in the fore wings, as in *T. colubrana*, Z. This difference in the neuration of the male and female has hitherto been regarded as characteristic of *Amorbia*, Clem., which, however, has no costal fold in the male.

PLATYNOTA, Clem.

PLATYNOTA ROSTRANA, Wkr.

Teras rostrana, Wkr. Cat. Lp. Ins. B. M. xxviii. p. 290 (1863).

=*Teras restitutana*, Wkr. Cat. Lp. Ins. B. M. xxviii. p. 292 (1863).

=*Teras connexana*, Wkr. Cat. Lp. Ins. B. M. xxviii. p. 293 (1863).

Platynota rostrana, Wlsm. Ill. Typ. Lp. Het. B. M. iv. 5–6, pl. lxii. fig. 1 (1879); Fern. Tr. Am. Ent. Soc. x. no. 114, p. 22 (1882).

Larva. Leaves of orange. (U. S., *Fern.*)

United States—Florida (*Fern.*).

S. America—Venezuela (*Wkr.*), Brazil (Ega, *Wkr.*).

West Indies—San Domingo (*Wkr.*), St. Vincent (Kingstown and windward side, 2 specimens, *Smith*).

These two specimens are in poor condition and the dark markings are not distinctly outlined by lines of semi-raised scales as in the type. They are also somewhat smaller; but on the strength of such material I cannot regard them as anything more than a local form.

PLATYNOTA REPANDANA, Wkr.

Teras repandana, Wkr. Cat. Lp. Ins. B. M. xxviii. p. 292 (1863).

West Indies—San Domingo (*Wkr.*)

The type of this species is erroneously recorded by Walker as a female, it is a male.

CERATORRHINETA.

(*CERORRHINETA*, Z.)

Type, ♂ ♀ *Cerorrhineta calidana*, Z. (Cuba). (Plate XLI. fig. 2, *a–e.*)

Antennæ, ♂, scaled and flattened beyond the basal joint, giving a bulged appearance, beyond which they are merely pubescent; ♀ simple.

Palpi, ♂, thickly clothed; long, curved downwards, apical joint short: ♀ very long (longer than in the ♂), much curved downwards, closely clothed throughout.

Head thickly clothed, with a slight projecting tuft.

Thorax smooth.

Fore wings, ♂, elongate, oblong; with a straight costal fold extending nearly to the apex: ♀ with the costal margin arched, especially towards the base: apical margin not oblique; with raised scales, as in *Platynota*, but these are not abundant. *Neuration* (♂ & ♀): 12 veins, 7 and 8 from a common stem, the fork enclosing the apex.

Hind wings (♂ & ♀) with the costal margin not excised. *Neuration*: 8 veins, 3 and 4 from a point, 5 slightly bent towards origin of 3 and 4, 6 and 7 approximate at origin.

Legs moderate, smooth.

CERATORRHINETA CALIDANA, Z.

Cerorrhineta calidana, Z., Hor. Soc. Ent. Ross. xiii. pp. 116–7 (1877).

West Indies—Cuba (*Z.*).

I am indebted to Dr. Staudinger for the opportunity of examining the types of this species.

CONCHYLIDINÆ.

CONCHYLIS, Tr.

CONCHYLIS LACTEIPALPIS, sp. n.

Antennæ luteous.

Palpi short, widened at the apex of the second joint with short appressed scales; apical joint short, distinct; cream-white.

Head creamy-white.

Thorax ferruginous, tending to pale ochreous posteriorly.

Fore wings mottled with dark chestnut-brown and bright ferruginous, the intermediate spaces whitish ochreous, apex and cilia whitish ochreous; basal patch rich ferruginous, somewhat angulated at its outer edge beyond the fold; a patch of dark chestnut-brown adjacent to it crosses the fold and extends, more or less interruptedly along the dorsal margin and fold to the lower angle of the cell; a rich ferruginous costal patch about the middle tapers obliquely outwards, and is separated from the other patches of chestnut scales beneath it by a rather shining leaden-grey streak; a rich ferruginous band crosses the wing obliquely before the apex, its inner edge nearly straight, its outer edge slightly angulated below its middle, this band commences on the costal margin at about one fifth from the apex, its lower edge reaching to about the middle of the apical margin; the space preceding it is mottled with rich ferruginous interspersed with leaden-grey scales on a cream-white ground; apex and cilia whitish ochreous.

Hind wings grey, with cilia of the same colour.

Abdomen grey; underside shining creamy-white.

Legs cream-white.

Exp. al. 8–10 millim.

Hab. West Indies—St. Vincent (windward side, 3 specimens, *Smith*).

Type, ♂.

CONCHYLIS PROLECTANA, Mschl.

Cochylis prolectana, Mschl. Ab. Senck. Nat. Ges. xv. pp. 332, 354 (1890).

West Indies—Portorico (*Mschl.*).

CONCHYLIS TECTONICA, Mschl.

Cochylis tectonica, Mschl. Ab. Senck. Nat. Ges. xv. pp. 332–3, 354 (1890).

West Indies—Portorico (*Mschl.*).

CONCHYLIS VICINITANA, Mschl.

Cochylis vicinitana, Mschl. Ab. Senck. Nat. Ges. xv. pp. 333, 354 (1890).

West Indies—Portorico (*Mschl.*).

CONCHYLIS BUNTEANA, Robs.

Conchylis bunteana, Robs. Tr. Am. Ent. Soc. ii. p. 288, pl. viii. fig. 86 (1869); Fern. Tr. Am. Ent. Soc. x. no. 144, p. 26 (1882).

United States—Pennsylvania (*Robs.*).

West Indies—St. Vincent (1 specimen, *Smith*).

A single specimen, probably referable to this species, is not in sufficiently good condition to be determined with certainty. The type has a slightly rosy tint, which is apparently wanting in this specimen (perhaps owing to its condition), but I should certainly regard it as a small variety of the same species.

CONCHYLIS, sp.? (near *angulatana*, Robs.).

West Indies—St. Vincent (windward side, 1 specimen, *Smith*).

Another species of this genus, somewhat smaller than *angulatana*, Robs. [Tr. Am. Ent. Soc. ii. p. 286, pl. viii. fig. 81 (1869)], from the United States, but presenting the same general character of markings, is also not in condition to be usefully described.

CONCHYLIS, sp.?

West Indies—St. Vincent (windward side, 1 specimen, *Smith*).

This specimen is in too poor condition to be determined.

GRAPHOLITHINÆ.

BACTRA, Stph.

BACTRA LANCEOLANA, Hb.

Tortrix lanceolana, Hb. Tortr. fig. 80 (1800).

Aphelia lanceolana, Stgr. & Wk. Cat. Lp. Eur. (ii.) no. 1006, p. 251 (1871).

Bactra lanceolana, Fern. Tr. Am. Ent. Soc. x. no. 163, pp. 28–9 (1882).

Europe, Africa, Asia, Australia, New Zealand, United States.

West Indies—St. Vincent (windward side, 4 specimens, *Smith*).

EPISIMUS, gen. n.

(ἐπίσιμος=somewhat short-nosed.)

Type, ♂ *Carpocapsa transferrana*, Wkr. (Brazil). (Plate XLI. fig. 3, *a*, *b*.)

Antennæ with the basal joint slightly enlarged, very slightly ciliate, scarcely more than half as long as the fore wings.

Palpi short, moderately clothed; apical joint exposed, scarcely projecting beyond the face.

Head very wide, flattened to the thorax, the face between the eyes much flattened, moderately rough-scaled above.

Thorax smooth.

Fore wings elongate, costal margin almost straight, ♂ without a costal fold, apical margin very slightly concave, anal angle rounded. *Neuration*: 12 veins, all separate; 3 much bent up towards 4 on the outer margin.

Hind wings rather triangular, apex somewhat acute, dorsal margin slightly and evenly rounded. *Neuration*: 8 veins; 3 and 4 from a point, 5 bent over towards origin of 4.

Apparently allied to *Cacocharis*, Wlsm., but without a thoracic tuft. Veins 3 and 4 of the hind wings are as in the group of genera allied to *Penthina*, Tr., but the neuration of the fore wings approaches more nearly that of the *Pædisca* group.

EPISIMUS TRANSFERRANA, Wkr.

Carpocapsa transferrana, Wkr. Cat. Lp. Ins. B. M. xxviii. p. 398 (1863).

South America—Brazil (Ega, *Wkr.*).

Var. VINCENTANA (an sp. n.?).

West Indies—St. Vincent (1 specimen, *Smith*).

With a single specimen before me, in very poor condition, I should not venture to describe it as a distinct species. It is obviously very similar to Walker's type from Ega; the chalybeous black top of the head is a strong distinguishing character, and the markings on the wings are approximately in the same position. Walker describes the darker shades as the ground-colour of the wing, whereas the paler colouring actually predominates (more so in this variety than in the type); moreover they have scarcely a trace of fawn-colour, and would be more accurately described as creamy-white. The slender leaden cross-streaks which occur in the type are wanting in this specimen, but the transverse linear arrangement of the scales is precisely the same, and if some of the grey streaklets which compose the medio-costal patch were prolonged in the direction of the dorsal margin they would exactly correspond to these lines, which Walker omits to mention in his description. I cannot venture to regard this specimen as distinct from *E. transferrana*, but it is probably a local variety.

Exp. al. 14 millim.

Type, ♂.

EPISIMUS AUGMENTANA, Z.

Grapholitha (*Hedya*) *augmentana*, Z. Hor. Soc. Ent. Ross. xiii. pp. 162–3 (1877).

West Indies—Cuba (*Z.*).

I am indebted to Dr. Staudinger for the opportunity of examining the type of this species.

Cacocharis, gen. n.

(κακόχαρις=ill-omened.)

Type, ♂ ♀ *Cacocharis albimacula*, Wlsm. (Plate XLI. fig. 4, *a*, *b*.)

Antennæ not more than half the length of the fore wings, simple in both sexes.

Palpi placed rather wide apart, short, projecting but little beyond the head; second joint somewhat dilated at the apex above and beneath; apical joint short, distinct.

Head moderately crested above.

Thorax with a strong erect crest posteriorly.

Fore wings rather ovate, costal margin slightly arched, ♂ without a costal fold, apex obtuse, apical margin not indented nor oblique, anal angle rounded. *Neuration*: 12 veins, all separate; 3 bent up towards 4 on the apical margin; 6 slightly bent down towards 5.

Hind wings trapezoidal, apex rounded, somewhat bulged between the apical and dorsal margins. *Neuration*: 8 veins; 3 straight, 4 from the same point as 3, bent upwards towards 5 on its basal half; 5 closely approximate to 4 at the base.

Legs with the hind tibiæ stout, somewhat clothed.

This genus is intermediate between *Pædisca*, Tr., and *Penthina*, Tr., approaching the latter in the possession of a thoracic tuft and in having veins 3 and 4 of the hind wings from a point; in all other respects it belongs to the group of *Pædisca*, but is without a costal fold.

Cacocharis albimacula, sp. n.

Antennæ and *palpi* reddish brown.

Head reddish brown.

Thorax reddish brown, with a conspicuous bright chestnut tuft posteriorly, preceded and followed by some whitish scales.

Fore wings rich chestnut-brown, with a conspicuous white costal patch about the middle of the wing, containing two or three minute black streaklets on the extreme costal margin; mottled with fuscous and purplish-grey patches; the white costal patch is preceded and followed by a fuscous tinge; a brownish patch lies on the outer half of the fold, and a blackish patch of somewhat raised scales near the base of the dorsal margin is surrounded by purplish grey; about the outer end of the brown patch is another space of purplish grey, and between this and the apical margin another transverse patch of the same colour, somewhat paler; one or two very faint pale oblique streaklets, from the costa before the apex, are joined to a slender pale line along the margin at the base of the cilia, which, however, does not reach the anal angle; cilia brown, tipped with fuscous.

Hind wings fuscous, with an iridescent tinge; cilia fuscous.

Abdomen fuscous.

Legs pale greyish cinereous; hind tarsal joints spotted with fuscous.

Exp. al. 14 millim.

Hab. West Indies—St. Vincent (1 specimen, *Smith*).
Type, ♀.
Having only a single ♀ of this species from St. Vincent I have used a ♂ from Brazil in drawing up the generic description.

Phoxopteris, Tr.

Phoxopteris viridisorsana, Mschl.

Phoxopteryx viridisorsana, Mschl. Ab. Senck. Nat. Ges. xv. pp. 334, 354 (1890).
West Indies—Portorico (*Mschl.*).

Grapholitha, H.-S.

Grapholitha livens, sp. n.

[*Head* missing.]
Thorax slaty grey.
Fore wings deep brownish fuscous, mottled with curved bands and spots of slaty-grey; the basal half of the wing is entirely occupied by transverse bands of this colour, separated from each other by slender lines of the dark ground-colour, of which one is longitudinal from the base, reaching but a short way into the wing; one above it, also short, is oblique from the costa; and one below it from the dorsal margin, somewhat wider, pointed obliquely outwards; the outer edge of the mottled basal patch is curved outwardly, reaching much farther along the dorsal than on the costal margin, where it does not attain to the middle of the wing; about the middle of the wing is an outwardly oblique costal streak of slaty-grey, curved at its lower end and more or less blended with a shorter streak beyond it; between this pair of streaks and the apex of the wing are three other similar streaks, the first running obliquely outwards from the costa to the upper third of the apical margin, where it meets a shorter and less oblique subapical streak; between these two is a third very short streaklet on the extreme costal margin; all these five streaks are touched with whitish scales, and some are also visible on the extreme costal edge of the basal patch; above the anal angle is an irregular, somewhat ocelloid, spot formed of two curved slaty-grey streaks; throughout the wings these slaty-grey bands are somewhat shining in contrast with the dull ground-colour; cilia dark slaty-grey. Underside unicolorous brownish fuscous, with five small whitish costal spots.
Hind wings brown; cilia pale grey.
Abdomen brownish.
Legs pale greyish; hind tarsal joints spotted alternately with greyish white and fuscous.
Exp. al. 12 millim.
Hab. West Indies—St. Vincent (1 specimen, *Smith*).
Type, ♀.
This specimen has unfortunately lost its head; there can be no doubt as to the genus in which it should be placed, but in markings

it is very distinct from anything with which I am acquainted. The pattern, although difficult to describe, is fairly well-defined.

GRAPHOLITHA ? EXCITANA, Mschl.

Grapholitha excitana, Mschl. Ab. Senck. Nat. Ges. xv. pp. 333–4, 354 (1890).

West Indies—Portorico (*Mschl.*).

COPTOLOMA, Ld.

COPTOLOMA ? FIGURANA, Z.

Grapholitha (Coptoloma ?) figurana, Z. Hor. Soc. Ent. Ross. xiii. pp. 163–5, pl. ii. fig. 55 (1877).

Imago, 17 December (*Z.*).

West Indies—St. Thomas (*Z.*).

COPTOLOMA ? ALBICAPITANA, sp. n.

Antennæ fuscous.

Head and *palpi* white.

Thorax fuscous.

Fore wings brownish fuscous, blending to ferruginous brown, about the apex much streaked and dotted with cream-white and steel-blue lines and spots; a steel-blue spot at the base of the costal margin is followed before the middle by an oblique short costal streak of the same colour, and this is also followed, beyond the middle, by a more slender similar streak, bulging outwardly, dilated and deflected towards the anal angle; near the dorsal margin, at one third from the base, is a cream-white spot, from above which a slender cream-white line, shaped like a horseshoe, is bowed outwards, and returns to a smaller cream-white spot above the fold, enclosing the outer end of a short longitudinal steel-blue streak; above the middle of the dorsal margin is a small steel-blue spot followed by another slightly above and beyond it, which is separated from a third elongate spot above the middle of the wing by a slender cream-white line; the two lower of these spots are enclosed by slender waved cream-white lines, at a little distance from them but following their outline; these lines do not reach the dorsal margin nor do they meet between the spots; on the chestnut-brown apical portion of the wing are two or three cream-white costal spots or streaks, the outer one being the longest, and having some steel-blue scales at its lower end; between these spots and around the apex the extreme margin of the wing is fuscous; cilia blue-grey. Underside unicolorous greyish fuscous, with three costo-apical white spots or streaks.

Hind wings brownish fuscous, darker towards the apex; cilia greyish.

Abdomen fuscous; underside cream-whitish.

Legs greyish fuscous; spurs paler.

Exp. al. 10 millim.

Hab. West Indies—St. Vincent (windward side, 1 specimen, *Smith*).

Type, ♀.

Having only a ♀ I am unable to be quite certain that this species is rightly referred to *Coptoloma*, Ld.

PÆDISCA, Tr.

PÆDISCA LONGIPALPANA, Mschl.

Grapholitha (*Pædisca*, Ld.) *longipalpana*, Mschl. Ab. Senck. Nat. Ges. xv. pp. 333, 354 (1890).

West Indies—Portorico (*Mschl.*).

CROCIDOSEMA, Z.

CROCIDOSEMA PLEBEIANA, Z.

Crocidosema plebeiana, Z. Is. 1847, p. 721; Stgr. & Wk. Cat. Lp. Eur. (ii.) no. 1269, p. 263 (1871).

Europe, Australia, South America (*Wlsm.*).

West Indies—St. Vincent (Kingstown, 1 specimen; windward side, 3 specimens, *Smith*).

This genus is apparently widely distributed in South America, as I have specimens from Brazil, Peru, and the Argentine Republic.

STREPSICRATES, Meyr.

Strepsicrates, Meyr. Tr. N.-Z. Inst. xx. p. 73 (1887).

=§ *Strepsiceros*, Meyr. Proc. Linn. Soc. N. S. W. vi. pp. 678–9 (1882).

STREPSICRATES SMITHIANA, sp. n.

Antennæ cinereous.

Palpi cinereous, mottled with brownish at the ends of the joints externally, hoary on their inner sides.

Head brownish cinereous, the lower half of the face hoary.

Thorax cinereous.

Fore wings dark brownish, pale cinereous along the dorsal margin beneath the fold; in the ♂ the costal fold is dark brown with a pale costal patch at its outer end, there is also a tuft of raised scales below the middle of the fold, and tufts of similar darker scales near the base above and below the fold; in the ♀ the tufts of raised scales are absent, and there appears to be some slight variation in the mottling of the wing-surface, the dark brown ground-colour becoming especially concentrated along the middle and above the outer end of the fold; the apical portion of the costa is much mottled with pale cinereous, which is diffused across the wing obliquely backwards towards the outer end of the fold; some pale cinereous scales about the anal angle; cilia brownish, tending to pale cinereous at the anal angle.

Hind wings semitransparent, blue-grey, obscured with brown along the veins and margin, especially towards the abdominal margin; cilia cinereous, with a pale line along their base.

Abdomen brownish cinereous.

Legs pale cinereous; hind tarsal joints faintly speckled.

Exp. al. 13–14 millim.

Hab. West Indies—St. Vincent (windward side, 3 specimens, *Smith*); Dominica (one specimen given me by Mr. H. Druce).

Type, ♂ ♀.

This species agrees in structure with *ejectana*, Wkr., an Australian species. I may remark that veins 6 and 7 of the hind wings, although perhaps not actually from a common stem, have so much the appearance of being so that a mistake might easily arise. They are almost anastomosed along their basal half, having the appearance of a double vein grooved along its under surface rather than of two separate veins. I find the same structure prevailing in the Australian species.

HELIGMOCERA, gen. n.

(ἑλιγμός=a sinuosity; κέρας=a horn.)

Type, ♂ *Heligmocera calvifrons*, sp. nov. (Plate XLI. fig. 5, *a–d.*)

Antennæ (♂) stout, strongly pubescent beneath; basal joint thickened, beyond which is a strong sinuosity on the upper side, extending over several joints.

Palpi not thickly clothed, with the basal joint unusually long, slightly upturned; second joint long, projecting forward; apical joint fully half the length of the second, slightly depressed.

Haustellum very short.

Head clothed above; face flattened, almost excavate between the eyes, and sloping back to the base of the antennæ.

Thorax not tufted.

Fore wings elongate, costa slightly arched, ♂ with a strong costal fold containing a thick mat of hairs; apical margin oblique, slightly concave, apex slightly produced, anal angle rounded. *Neuration*: 12 veins; 3 and 4 closely approximate throughout, curved upwards nearly to middle of apical margin; 5 straight, arising very near 4, about the lower angle of cell and ending on the middle of the apical margin in close proximity to 4; 6 bent down towards 5 on margin; 7 and 8 from a common stem, 7 bent down towards 6, 8 to costal margin above apex; 9 arising from upper angle of cell close to origin of 7+8.

Hind wings broader than the fore wings, with a broadly lanceolate apex, abdominal angle strongly developed and heavily fringed, especially at the base. *Neuration*: 8 veins; 3 and 4 from a long common stem; 5 bent over to origin of 3+4; 6 and 7 from a common stem.

Legs: hind tibiæ densely clothed with projecting scales above the spurs.

HELIGMOCERA CALVIFRONS, sp. n.

Antennæ cinereous.

Palpi cinereous.

Head cinereous above; face whitish.

Thorax cinereous.

Fore wings (♂) with a broad costal fold; cinereous, mottled with brownish; with an ill-defined greenish basal patch, mottled with brownish, extending along the dorsal margin to nearly one third the wing-length, where is a patch of deep brownish fuscous scales; beyond it is a broad ill-defined pale space; the apical half of the wing mottled with greenish and brownish fuscous; a chestnut-brown spot immediately before the anal angle; the costal margin very pale cinereous, almost whitish, with a series of oblong brownish fuscous streaks alternately short and long, the long ones terminated by a few chestnut-brown scales; there are some shining greenish-grey metallic scales about the ocelloid spot which is separated from the apex by a curved brownish fuscous line occupying the middle of the apical margin, and recurved in the direction of the upper angle of the cell, where it nearly joins the middle costal streak, the extreme apex brownish fuscous; cilia pale cinereous along their base, brownish fuscous beyond.

Hind wings semitransparent, iridescent, blue-grey, matted with brownish cinereous scales about the abdominal margin, and with a strong fringe of subochreous matted scales from the base near the abdominal margin; cilia greyish fuscous, with a pale line along their base.

Abdomen brownish fuscous mottled with pale cinereous, anal tuft paler. Underside pale cinereous.

Hind legs brownish fuscous mottled with pale cinereous, tarsal joints also spotted with pale cinereous or subochreous.

Epp. al. 13 millim.

Hab. West Indies—St. Vincent (windward side, 2 specimens, *Smith*).

Type, ♂.

TINEIDÆ.

TINEINÆ.

TINEA, L.

TINEA PLUMELLA, sp. n.

Antennæ with the basal joint slightly hairy; greyish, with indistinct paler annulations.

Maxillary palpi folded.

Labial palpi short, projecting; greyish.

Head hairy above and in front; dingy grey.

Thorax pale whitish grey.

Fore wings dingy whitish, sprinkled with brownish-grey scales, especially on the basal half; a brownish-grey spot at the base of the fold; an indistinct transverse fasciaform band of scattered brownish-grey scales about the middle is diffused outwards on reaching the fold, reverting to the dorsal margin; beyond it the white ground-colour is less sprinkled for a short space, but the apical third of the wing is blotched with brownish-grey spots, more or less connected by intermediate scattered scales—one central at the end of the cell; two costal, the first immediately above the central one, the other beyond it; one apical at the extreme apex; two less conspicuous dorsal ones, the first small, immediately below the central spot, the second also inconspicuous, immediately opposite the outer costal spot; cilia dingy whitish, with some brownish-grey scales running through them wherever the dark spots touch the margin.

Hind wings pale grey; cilia whitish grey.

Abdomen very pale brownish grey.

Exp. al. 6½ millim.

Hab. West Indies—St. Vincent (1 specimen, *Smith*).

Type, ♀.

A small but sufficiently distinct species, probably approaching *cumulatella*, Z., from South America, but having a whiter ground-colour.

TINEA sp.

West Indies—St. Vincent (1 specimen, *Smith*).

A single specimen in too poor condition to determine.

Exp. al. 6 millim.

TINEA ? sp., Btl.

Tinea ? sp., Btl. P. Z. S. 1878, p. 495.

West Indies—Jamaica (*Btl.*).

DENDRONEURINÆ, subfam. nov.

Labial palpi strongly developed, folded.

Fore wings with veins 5, 7, and 8 out of 6.

DENDRONEURA, gen. nov.

(δένδρον = a tree; νεῦρον = a nerve.)

Type, ♂ *Dendroneura præstans*, Wlsm. (Plate XLI. fig. 6, *a–c*.)

Antennæ nearly as long as the fore wings; basal joint flattened, scarcely enlarged.

Maxillary palpi well developed, folded.

Labial palpi short, depressed, clothed with appressed scales; apical joint scarcely shorter than the second, flattened, subovate.

Haustellum moderate.

Head much flattened, with a strong brush of radiating scales from each side behind the eyes.

Thorax somewhat flattened, smooth.

Fore wings long, narrow, acuminate, costal and dorsal margins nearly straight, anal angle obsolete; a narrow mat of scales along the costal margin beneath gives the appearance of a downward fold.

Neuration: 12 veins; 2 from near lower angle of cell; 3 from angle of cell; 4 separate from 3; 6 from upper angle of cell to apical margin; 7 and 8 one after another out of 6, the one before, the other behind the origin of 5, 7 to costa; 9, 10, and 11 separate; a small supplementary cell caused by the continuation of 6 to between 10 and 11.

Hind wings narrow, evenly lanceolate, acuminate; with very long cilia extending to the base of the costal margin. *Neuration*: 8 veins; 3 and 4 separate; 5 and 6 from a common stem, 6 to apex; 7 parallel with 6.

Abdomen somewhat flattened.

Legs with the hind femora much flattened and somewhat concave at their outer sides; hind tibiæ hairy.

This very inconspicuous and ordinary-looking Tineid differs entirely in its structural characters from any genus or subfamily hitherto described; the neuration is very peculiar, somewhat resembling that of *Œcocecis*, Gn., to which, however, it is not allied.

A single female, possessing the same remarkable neuration which characterizes this genus, differs in the structure of the palpi and in the slightly greater expanse and breadth of the wings. Having at first regarded it as a separate species, I am now strongly convinced that it is but the other sex of *Dendroneura præstans*. A description, so far as it indicates structural differences, is appended:—

Labial palpi porrected, scarcely twice the length of the head; second joint with a projecting brush of scales below, a pecten of three or four separate hairs on its outer side near the apex; apical joint smooth, short, scarcely more than half the length of the second joint, not recurved nor erect.

Abdomen laterally compressed; ovipositor extended, long.

If any reasonable doubt can be entertained as to the identity of this female with the male on which the genus is founded, it must be based upon the difference in the shape of the head, which is of the ordinary form, not flattened or fringed at the side in the manner so remarkable in the type.

DENDRONEURA PRÆSTANS, sp. n.

Antennæ and *palpi* pale greyish ochreous.

Head pale greyish ochreous; face shining white.

Thorax dull greyish ochreous.

Fore wings dull greyish ochreous, with a narrow transverse line of slightly raised brownish fuscous scales before the apex, at the upper end of which is a minute oblique spot of similar scales turning backwards from the costal margin; cilia dull greyish, with an ochreous tinge.

Hind wings pale greyish, with a slight ochreous tinge; cilia greyish, tinged with ochreous towards their apex.

Abdomen rather shining, ochreous.

Legs shining, pale cinereous; tarsal joints unspotted.

Exp. al. ♂ 12 millim., ♀ 14 millim.

Hab. West Indies—St. Vincent (windward side, 2 specimens, *Smith*).

Type, ♂.

Setomorphinæ.

Setomorpha, Z.

Setomorpha rupicella, Z.

Setomorpha rupicella, Z. Hand. Kong. Svensk. Vet.-Ak. 1852, pp. 95–6.

West Indies—Cuba (Havannah, *Z.*).

This species, having been described by Zeller in a paper entitled "Lepidoptera Microptera quæ J. A. Wahlberg in Caffrorum terra collegit," is not unlikely to be overlooked.

Anaphorinæ.

Eulepiste, Wlsm.

Type, *Eulepiste cressoni,* Wlsm. (United States).

In the original description of this genus (Tr. Am. Ent. Soc. x. p. 169, 1882), which was not corrected in my revision of the *Anaphorinæ* (Tr. Ent. Soc. Lond. 1887, p. 142), I fear that I must have mistaken the basal joint of the palpi for the second joint, the second joint being much less roughly clothed than the basal, and the apical joint is almost smooth. The proportionate length that they bear to each other is approximately as follows:—the second joint is rather longer than the apical joint, and the basal joint is about equal in length to the second; the apical joint stands for its whole length clear above the head, but it is not recurved.

Eulepiste umbratipalpis, sp. n. (Plate XLI. fig. 10.)

Antennæ pale fawn, closely barred above with dark umber-brown, basal joint dark umber-brown above.

Palpi very dark umber-brown.

Head pale fawn above, speckled with dark umber-brown.

Thorax pale fawn, shaded anteriorly and around the margins with dark umber-brown and a few reddish-brown scales.

Fore wings pale fawn, thickly spotted and shaded with dark umber-brown, with some reddish-brown scales intermixed, the markings on the costal margin somewhat more distinctly separated from each other than are those on the wing-surface; the most conspicuous and darkest shading is above the anal angle, on the space between the end of the cell, and on the lower half of the costal margin; cilia dark umber-brown, mixed with pale fawn and reddish brown. Underside shaded with dark umber-brown, a pale fawn line running along the base of the cilia and around the apical margin.

Hind wings cinereous, a slightly paler line running along the base of the cilia. Underside cinereous.

Abdomen cinereous; lateral claspers slender, evenly depressed posteriorly; uncus slender, double, the points closely approximate.

Hind legs dark brownish; tarsal joints spotted with pale fawn.

Exp. al. 19 millim.

Hab. West Indies—San Domingo, 1884.

Type, ♂ Mus. Wlsm.

I have a single specimen, for which I am indebted to Dr. Fernald.

Acrolophus, Poey.

Acrolophus vitellus, Poey. (Plate XLI. fig. 11.)

Acrolophus vitellus, Poey, Cent. Lp. Cuba, pl. (xx.) (1833); Wlsm. Tr. Ent. Soc. Lond. 1887, p. 148.

West Indies—Cuba (*Poey*); ? Portorico (*Wlsm.*).

A specimen in Dr. Staudinger's collection from Portorico agrees with Poey's description in the structure of the palpi and antennæ as well as in neuration; the fore wings have the usual indication of a biangulate line along the neighbourhood of the fold, margined with dark shades above and by the pale ground-colour below, this line runs slenderly but distinctly to the base; two angular dark shades cross the fold, the outer one being connected on the left wing by two lines of darker scales to the middle of the dorsal margin; costal margin distinctly spotted, the spots near the base taking the form of waved striæ reaching to the upper edge of the cell. The hind tarsal joints are somewhat strongly clothed with tufts of scales, reminding one of *Thysanoscelis*, Wlsm. I have not observed this character in any other specimen of the same family from the West Indies. The genital segments of this specimen are given on Plate XLI. fig. 11. The uncus is double.

Exp. al. 22 millim.

Acrolophus poeyi, sp. n. (Plate XLI. fig. 12.)

Antennæ, ♂, stout, simple, reaching to about two thirds the length of the wing; ♀ somewhat more slender than in the ♂.

Palpi, ♂, long and recurved, not thickly clothed and not reaching so far as the back of the head; umber-brown, tinged with whitish ochreous beneath: ♀, projecting, conical.

Head and *thorax* umber-brown.

Fore wings: ♂, umber-brown, with a few paler mottlings and specklings of brownish ochreous along the costal and dorsal margins and towards the apex, and with some small fuscous spots of scales scattered throughout the wing; costal margin narrowly brownish ochreous throughout; no particular pattern is visible on the wing, but there is a tendency in the distribution of the blackish scale-spots to form a sinuous dividing line along the fold, leaving the dorsal portion below it of the paler tint; cilia brownish ochreous, with a dark line running through their middle: ♀ almost unicolorous pale umber-brown, having a less mottled or speckled appearance than the ♂.

Hind wings umber-brown, with cilia of the same colour.

Abdomen umber-brown. *Genital segments*, ♂: uncus single, bent over at right angles; lateral claspers slender and of almost even width throughout, rounded at the ends and not projecting beyond the uncus.

Legs greyish; hind tarsal joints speckled alternately with umber-brown and subochreous; hind tibiæ slightly hairy.

Exp. al. ♂ 10–12 millim., ♀ 11–18 millim.

Hab. West Indies—St. Vincent (windward side, 10 specimens, *Smith*).

Type, ♂ ♀.

I have named this species after the late Prof. Felipe Poey, the author of 'Centurie de Lépidoptères de l'île de Cuba' (Paris, 1833 *et seq.*), a book which I have in vain endeavoured to find in the market for many years.

ACROLOPHUS NIVEIPUNCTATA, sp. n.

Antennæ pale fawn.

Palpi reddish fawn mixed with rust-brown, which is especially noticeable on the exposed side; apical tuft long, almost entirely rust-brown.

Head and *thorax* reddish fawn mixed with rust-brown.

Fore wings pale reddish fawn, suffused with rust-brown over the greater portion of the wing-surface, except along the dorsal margin and about the apical margin and apex, the pale ground-colour appears also at the extreme base; the rust-brown shading projects into the paler colour, first in an angulated excrescence near the base, which crosses the fold, and secondly in a semicircular projection a little before the middle, which crosses the middle of the fold, from the outer and upper edge of this the rust-brown shading is deflected to the anal angle; a chain of about seven small fan-like, raised snow-white scales, commencing near the base, forms a straight margin to the upper edge of the first angular projection, reaching to the highest point of the pale ground-colour above the fold; a second chain of similar snow-white scales commences within the outer and upper portion of the semicircular projection, consisting of about nine raised dots, follows the edge of the dark shading about halfway along its deflection to the anal angle; the apical portion of the wing is slightly speckled with rust-brown, a few inconspicuous streaklets of the same colour occur near the apical margin and on the pale dorsal space; cilia mixed pale fawn and rust-brown. Underside greyish fuscous, tinged with rust-brown along the costal margin.

Hind wings stone-greyish; cilia scarcely paler. Underside dull greyish fuscous, slightly paler than in the fore wings.

Abdomen missing. (A female abdomen is stuck on to this specimen.)

Legs pale stone-grey, somewhat tinged with rufous beneath; hind tarsi not tufted above.

Exp. al. 31 millim.

Hab. West Indies—Cuba.

Type, ♂ Mus. Stgr.

ACROLOPHUS PLUMIFRONTELLUS, Clem.

Anaphora plumifrontella, Clem. Proc. Ac. Nat. Sc. Phil. xi. p. 261 (1859); Stn. Tin. N. Am. pp. 39, 57, 59, 60 (1872).

Acrolophus plumifrontellus, Wlsm. Tr. Ent. Soc. Lond. 1887, pp. 149–50, pl. vii. fig. 5; Mschl. Ab. Senck. Nat. Ges. xv. pp. 336, 354 (1890).

United States—Pennsylvania, N. Carolina, Massachusetts, New York.

West Indies—Portorico (*Mschl.*), Cuba (*Wlsm.*).

ACROLOPHUS WALSINGHAMI, Mschl. (Plate XLI. fig. 13.)

Acrolophus walsinghami, Mschl. Ab. Senck. Nat. Ges. xv. pp. 335, 336, 354 (1890).

West Indies—Portorico (*Mschl.*).

A specimen in Dr. Staudinger's collection, also from Portorico, which appears to be this species, has the anal claspers slender, incurved, of almost even width throughout, very slightly widened and obliquely rounded upwards at the end; uncus single.

ACROLOPHUS LEUCODOCIS, Z.

Anaphora leucodocis, Z. Hor. Soc. Ent. Ross. xiii. pp. 197–8 (1877); Wlsm. Tr. Ent. Soc. Lond. 1887, pp. 159–60.

? Brazil (*Z.*).

West Indies—Cuba (*Z.*).

I am indebted to Dr. Staudinger for the opportunity of examining Zeller's type, which is labelled "Brasil ?" It is a very distinct species, having a pale line running to the end of the cell from the middle of the base, which is continued in three slender lines along the veins to the apical margin; this is bordered on the upperside by a blackish line, which reaches beyond the end of the cell, and there are three lines of black atoms, the first beneath the costa to two thirds from the base, the second along the lower edge of the cell reaching to its end and sometimes continued downwards to the apical margin above the anal angle, the third is below the fold. I am unable to describe the genital segments, as the type, which is a male, has a female abdomen stuck on to it. Exp. al. 22 millim.

The antennæ are simple, and it should therefore be placed in the genus *Acrolophus*.

CÆNOGENES, Wlsm.

CÆNOGENES PUSILLA, Z.

Anaphora pusilla, Z. Hor. Soc. Ent. Ross. xiii. pp. 196–7 (1877); Wlsm. Tr. Ent. Soc. Lond. 1887, pp. 158–9, pl. viii. f. 13.

In my revision of the *Anaphorinæ* this species was retained by error in the genus *Anaphora*, Clem., whereas it should have been placed in *Cænogenes*; this mistake was occasioned by my having failed to observe in my previous examination that veins 8 and 9 of the fore wings arise from a short common stem. The antennæ are pilose and serrate throughout on one side, but they differ slightly from those of the type of *Cænogenes*, which has them serrate on both sides.

Hab. Colombia—Barranquilla (*von Nolcken*).

West Indies—Dominica (*Druce*).

A single specimen, for which I am indebted to Mr. Druce, is undistinguishable from Zeller's type, but it is not in good condition.

Cænogenes ? ochracea, Mschl.

Cænogenes ? ochracea, Mschl. Ab. Senck. Nat. Ges. xv. pp. 337, 354 (1890).

West Indies—Portorico (*Mschl.*).

Anaphora, Clem.

Anaphora popeanella, Clem.

Anaphora popeanella, Clem. Proc. Ac. Nat. Sc. Phil. xi. p. 261 (1859); Stn. Tin. N. Am. pp. 57–8 (1872); Wlsm. Tr. Ent. Soc. Lond. 1887, pp. 161–3, pl. viii. f. 11 ; Mschl. Ab. Senck. Nat. Ges. xv. pp. 337, 354 (1890).

United States—Texas, Missouri, N. Carolina.

West Indies—Portorico (*Mschl.*).

I am somewhat doubtful whether Möschler was rightly acquainted with this species.

Anaphora arcasalis, Wkr.

Palthis ? arcasalis, Wkr. Cat. Lp. Ins. B. M. xvi. pp. 153–4 (1858).

West Indies—San Domingo (*Wkr.*).

Anaphora mimasalis, Wkr.

Palthis ? mimasalis, Wkr. Cat. Lp. Ins. B. M. xvi. p. 154 (1858).

West Indies—San Domingo (*Wkr.*).

Anaphora noctuina, sp. n. (Plate XLI. fig. 14.)

Antennæ bone-ochreous.

Palpi, head, and *thorax* pale fawn, much mixed with purplish grey and fuscous.

Fore wings pale fawn, almost entirely suffused with purplish fuscous, the ground-colour showing chiefly along the fold, and on and beyond the end of the cell and about the apex; two slender angulated blackish marks on the fold, the outer one enclosing a reddish-brown spot; another reddish-brown spot lies above and between these two, about the middle of the cell, and this is externally margined with blackish; a few reddish-brown scales at the end of the cell intermixed with blackish, the same mixture being continued in a rather diffused curved line downwards towards the anal angle as far as vein 4, and thence upwards and outwards towards the apex, forming the lower margin of a space of the pale ground-colour; cilia purplish grey, mottled with pale fawn.

Hind wings pale fawn, faintly shaded with brownish; cilia pale fawn.

Abdomen pale fawn; lateral claspers shaped somewhat as in a marrow-spoon, elongate, scarcely spatulate, with almost parallel margins, rounded at the ends; uncus double.

Legs pale fawn; hind tarsi faintly spotted.

Exp. al. 30½ millim.

Hab. West Indies—Cuba.

Type, ♂ Mus. Stgr.

I have adopted the specific name from a label placed by Zeller on Dr. Staudinger's specimen.

Felderia, Wlsm.

Felderia dimidiella, sp. n. (Plate XLI. fig. 15.)

Antennæ pale fawn-ochreous.

Palpi umber-brown at the base, pale fawn-ochreous beyond.

Head and *thorax* pale fawn-brown.

Fore wings pale fawn, sprinkled, speckled, and shaded with brownish scales; a series of dark umber-brown spots—the first small, a little below the costal margin near the base; the second larger, on the fold before the middle; the third also large, on the fold beyond the middle; the fourth at the end of the discal cell, a slight indication of a fifth spot lying parallel with the middle of the apical margin; cilia very pale fawn.

Hind wings dingy whitish fawn; cilia scarcely paler.

Abdomen dingy whitish fawn.

Legs whitish fawn; tarsi unspotted.

Exp. al. 20 millim.

Hab. West Indies—Cuba.

Type, ♂ Mus. Stgr.

The pectinations of the antennæ are much shorter than in *Felderia doeri*, Wlsm., the type of the genus. This specimen is labelled in Zeller's handwriting "*Acrolophus vitellus* nicht beschr." It cannot be *vitellus*, Poey, as the antennæ of that species are described as simple.

Bazira, Wkr.

Bazira, Wkr. Cat. Lp. Ins. B. M. xxx. p. 1009 (1864).
=§*Eddara*, Wkr. Cat. Lp. Ins. B. M. xxviii. pp. 517–8 (1863).

Bazira xylinella, Wkr.

Eddara xylinella, Wkr. Cat. Lp. Ins. B. M. xxviii. p. 518 (1863).
Bazira xylinella, Wkr. Cat. Lp. Ins. B. M. xxx. p. 1009 (1864).
West Indies—Jamaica (*Wkr.*).

The type of this species is erroneously recorded by Walker as a male; it is a female. In the absence of the male, it is impossible to say whether this genus can be regarded as distinct. The palpi are short and porrect; the fore wings have 12 veins, all separate, and the hind wings 8 veins, all separate. I am inclined to think it is allied to *Pseudanaphora arcanella*, Clem.

Euplocaminæ.

Amydria, Clem.

Amydria anaphorella, sp. n.

Antennæ, ♂, simple, basal joint somewhat enlarged; brownish.

Palpi erect, second joint roughly clothed beneath; apical joint less than half the length of the second joint; brownish ochreous, tinged with brown externally on the second joint.

Head brownish ochreous.

Thorax greyish fuscous.

Fore wings greyish fuscous, with a slight bluish tinge, speckled with a reduplicated line of darker spots along the basal half of the costal margin, and three or four spots on the margin beyond the middle; a quadrate chocolate-brown patch at the end of the cell is preceded by a paler reddish-brown elongate spot, and followed by a brownish-ochreous space extending to the apex; a second elongate chocolate-brown patch on and above the outer half of the fold is also preceded by a shorter elongate reddish-brown spot, of which equal parts are on the upper and under side of the fold; cilia brownish ochreous, shaded with greyish fuscous.

Hind wings brownish grey; cilia slightly paler.

Abdomen brownish grey.

Legs greyish cinereous, tarsal joints faintly pale-spotted.

Exp. al. 22 millim.

Hab. West Indies—St. Vincent (windward side, 1 specimen, *Smith*).

Type, ♂.

This species has the same neuration as Clemens' genus *Amydria*, all the veins in both fore and hind wings being separate: the apical joint of the palpi is not tufted as in *Pseudanophora*, Wlsm., nor recurved as in *Anaphora*, Clem.; it is, however, more erect than in *effrenatella*, Clem., the type of *Amydria*, and appears to form a connecting-link between this genus and *Pseudanaphora*.

Myrmecozela, Z.

Myrmecozela ochraceella.

Tinea ochraceella, Tengstr. Not. Sällsk. Faun. et Flor. Fenn. För. ii. p. 111 (1847).

Myrmecozela ochraceella, Z. Lin. Ent. vi. pp. 176–7 (1852); Stgr. & Wk. Cat. Lp. Eur. (ii.) no. 1435, p. 271 (1871); Mschl. Ab. Senck. Nat. Ges. xv. pp. 339, 354 (1890).

Europe.

West Indies—Portorico (*Mschl.*).

Tiquadra, Wkr.

Tiquadra, Wkr. Cat. Lp. Ins. B. M. xxviii. p. 519 (1863); type *Tiquadra inscitella*, Wkr. (Mexico).

=*Oscella*, Wkr. Cat. Lp. Ins. B. M. xxix. pp. 783–4 (1864); type *Oscella æneonivella*, Wkr. (Venezuela).

= *Manchana*, Wkr. Cat. Lp. Ins. B. M. xxxv. p. 1818 (1866); type *Manchana avitella*, Wkr. (Santa Martha).

= *Acureuta*, Z. Hor. Soc. Ent. Ross. xiii. pp. 198–9 (1877); type *Acureuta aspera*, Z. (Colombia).

TIQUADRA ASPERA, Z.

Acureuta aspera, Z. Hor. Soc. Ent. Ross. xiii. pp. 199–201 (1877).

Tiquadra aspera, Mschl. Ab. Senck. Nat. Ges. xv. pp. 339, 354 (1890).

Colombia.

West Indies—Portorico (*Mschl.*).

TIQUADRA LENTIGINOSA, Z.

Acureuta lentiginosa, Z. Hor. Soc. Ent. Ross. xiii. pp. 201–2 (1877).

Brazil, Peru.

West Indies—Trinidad (Port of Spain: *Wlsm.*).

I have a single female from Trinidad, for which I am indebted to Mr. J. H. Hart; this agrees with specimens of the same sex from Petropolis (Brazil), which I am unable to separate from *Acureuta lentiginosa*, Z. The males have the hind wing somewhat more ochreous than in the female and the fore wings less profusely spotted, but the amount of grey scaling on their surface is somewhat variable.

TIQUADRA ? sp.

West Indies—Dominica.

A single specimen received from Mr. Druce, collected in Dominica, is of a much darker colour and smaller size; moreover there is a conspicuous difference in the neuration of the fore wings, which have veins 3 and 4 arising from a short stalk. It may possibly constitute a new genus; but the specimen is a female, and in such poor condition that it cannot be usefully described.

PEXICNEMIDIA, Mschl.

PEXICNEMIDIA MIRELLA, Mschl.

Pexicnemidia mirella, Mschl. Ab. Senck. Nat. Ges. xv. pp. 338, 354 (1890).

West Indies—Portorico (*Mschl.*).

PLUTELLINÆ.

PLUTELLA, Schrk.

PLUTELLA CRUCIFERARUM, Z.

Plutella cruciferarum, Z. Stett. Ent. Zeit. 1843, p. 281; Stgr. & Wk. Cat. Lp. Eur. (ii.) no. 1626, pp. 281, 425 (1871).

= *Plutella xylostella*, Mschl. Ab. Senck. Nat. Ges. xv. pp. 341, 354 (1890).

Europe, Asia, Africa, North America, South America, Australia.
West Indies—Portorico (*Mschl.*).

Gelechianæ.

Gelechia, Z.

GELECHIA DONATELLA, Wkr.

Gelechia donatella, Wkr. Cat. Lp. Ins. B. M. xxix. pp. 596–7 (1864).

West Indies—Jamaica (*Wkr.*).

GELECHIA ROBUSTELLA, Wkr.

Gelechia robustella, Wkr. Cat. Lp. Ins. B. M. xxix. p. 597 (1864).

West Indies—San Domingo (*Wkr.*)

GELECHIA ATTENUATELLA, Wkr.

Gelechia attenuatella, Wkr. Cat. Lp. Ins. B. M. xxx. p. 1019 (1864).

West Indies—Jamaica (*Wkr.*).

GELECHIA EXCLARELLA, Mschl.

Gelechia exclarella, Mschl. Ab. Senck. Nat. Ges. xv. pp. 343–4, 354 (1890).

Surinam (*Mschl.*).
West Indies—Portorico (*Mschl.*).

GELECHIA COSTIPUNCTELLA, Mschl.

Gelechia costipunctella, Mschl. Ab. Senck. Nat. Ges. xv. pp. 344, 534 (1890).

West Indies—Portorico (*Mschl.*).

GELECHIA RIVULELLA, Mschl.

Gelechia rivulella, Mschl. Ab. Senck. Nat. Ges. xv. pp. 344, 354 (1890).

West Indies—Portorico (*Mschl.*).

GELECHIA CINEREOCERVINA, sp. n.

Antennæ pale greyish fawn.

Palpi with projecting scales above towards the apex of the second joint, apical joint about equal in length to the second, slender and slightly recurved; pale greyish fawn, darkened externally on the second joint.

Head pale greyish fawn; face paler.

Thorax pale greyish fawn.

Fore wings with 12 veins; 7 and 8 from a point, running to the costa; dull greyish fawn, with a small fuscous spot on the middle, followed by another at the end of the cell, slightly preceded by one below it on the fold; an elongate narrow fuscous shade along the costal margin beyond the middle and four fuscous dots around the apex—two on the costal and two on the apical margin; cilia dull greyish fawn.

Hind wings with 8 veins: 3 and 4 from a point; 6 and 7 from a point; cell closed; trapezoidal, with a very oblique and scarcely indented apical margin; grey with grey cilia.

Abdomen and *legs* grey.

Expl. al. 8 millim.

Hab. West Indies—St. Vincent (windward side, 2 specimens, *Smith*).

Type, ♂.

GELECHIA, sp., Snell.

Gelechia, sp., Snell. Tijd. v. Ent. xxx. p. 66 (1887).

West Indies—Curaçao (*Snell.*).

GELECHIA? sp., Snell.

Gelechia? sp., Snell. Tijd. v. Ent. xxx. p. 66 (1887).

West Indies—Curaçao (*Snell.*).

BRYOTROPHA, Hein.

BRYOTROPHA TRANSLUCIDA, sp. n.

Antennæ pale cinereous, faintly speckled with fuscous.

Palpi cinereous; apical joint speckled with fuscous.

Head cinereous.

Thorax cinereous, with a slight ochreous tinge.

Fore wings deep brownish fuscous, the extreme base subochreous; with a broad oblique fascia across the middle of the wing, subochreous mottled with brownish; a few subochreous spots about the costal and dorsal margins before the apex; cilia greyish.

Hind wings semitransparent, iridescent greyish; cilia grey.

Abdomen greyish fuscous, faintly barred with paler colour.

Legs pale greyish ochreous.

Exp. al. 12–14 millim.

Hab. West Indies—St. Vincent (windward side, 3 specimens, *Smith*); Dominica (1 specimen, *Druce*).

Type, ♀.

BRYOTROPHA, sp.?

West Indies—St. Vincent (1 specimen, *Smith*).

Allied to *translucida*, but in too poor condition to be described.

LITA, Tr.

LITA CROCIPUNCTELLA, sp. n.

Antennæ dark umber, very faintly annulated.

Palpi dark umber, with the apex of the second joint and the extreme apex of the apical joint whitish ochreous, a few whitish-ochreous scales interspersed at the sides.

Head dark umber-brown, mixed with a few hoary scales.

Thorax dark umber, sprinkled with hoary scales and fringed with hoary scales posteriorly.

Fore wings dark umber, irrorated with pale ochreous scales and sprinkled with orange-yellow spots, some of which are faintly margined with raised blackish scales; the arrangement of the spots is somewhat as follows:—one at the base below the costal margin; two on the fold, each followed by black scales; one on the middle of the wing and one beyond it towards the end of the cell, brighter and more conspicuous and followed by raised blackish scales; at one fourth from the apex, a large orange-yellow spot on the costal and an opposite one on the dorsal margin, with one small spot at the extreme apex; cilia dark umber-grey on the dorsal margin.

Hind wings brownish grey; cilia greyish.

Abdomen dark umber; anal tuft bright ochreous.

Legs very pale greyish ochreous, barred and banded with brownish fuscous.

Exp. al. 12 millim.

Hab. West Indies—St. Vincent (windward side, 1 specimen, *Smith*).

Type, ♀.

Pœcilia, Hein.

Pœcilia extranea, sp. n.

Antennæ [broken], a black line along each side of the basal joint, which is otherwise white.

Palpi with long projecting divided scales beneath the second joint, whitish on the inner side, streaked with brown and chestnut on the outer side; apical joint distinctly barred with black near the base and towards the apex.

Head and *face* white.

Thorax cinereous, mottled with brownish fuscous at the sides and posteriorly.

Fore wings brownish fuscous at the base for one third their length, cinereous speckled with brownish fuscous beyond, much shaded with brownish fuscous on the apical fourth; a slender white line commencing at the base and following the costal margin is bent downwards and forms a sinuous outer edge to the basal patch, reaching the dorsal margin obliquely before the middle; another slender white line commencing below the middle of the costa is sinuated outwards and downwards to the anterior edge of the dark apical fourth, where it meets a shorter, slender white line, which reverts obliquely to the dorsal margin; along the extreme apical margin is a narrow whitish line enclosing a short series of black dots; cilia pale cinerous, with a reduplicated darker line running through them, cilia on the dorsal margin grey.

Hind wings grey; cilia grey.

Abdomen greyish.

Legs very pale cinereous; hind tibiæ very pale cinereous, shaded with brownish fuscous externally; posterior tarsal joints fuscous, dotted with white; spurs pale cinereous; the middle pair of legs are blackish, with slender white oblique lines on their outer sides.

Exp. al. 10 millim.

Hab. West Indies—St. Vincent (May, 1 specimen, *Smith*).

Type, ♂.

Didactylota, nom. n.

(δίς=twice; δακτυλωτός=fingered.)

= § *Dactylota*, Snell. Tijd. v. Ent. xix. pp. 23–7 (1876).

Type, ♂ ♀ *Dactylota kinkerella*, Snell.

The name *Dactylota*, given by Snellen to this genus, being preoccupied by Brandt in the Echinodermata (1835), I have thought it desirable to change it to *Didactylota*, a name which if read in a certain sense is sufficient to indicate its origin, but which equally applies to the structure of the genus.

Didactylota bicolor, sp. n.

Antennæ pale fawn.

Palpi very pale fawn.

Head and *thorax* rich fawn-brown.

Fore wings rich fawn-brown to very near the middle, beyond fuscous speckled with pale cinereous; the margin of the two colours is straight and distinct across the wing, but with no dividing-line; cilia pale cinereous, with a line of fuscous scales along their middle.

Hind wings pale greyish fuscous; cilia long, purplish grey.

Abdomen fuscous, pale cinereous beneath; the protruding anal claspers white.

Legs pale cinereous, with long greyish hairs on the hind tibiæ above, projecting over the spurs; hind tarsal joints barred with fuscous.

Exp. al. $7\frac{1}{2}$ millim.

Hab. West Indies—St. Vincent (windward side, 1 specimen, *Smith*).

Type, ♂.

This is the third species of the genus now known. The hind wings distinctly divided to one fourth into two separate lobes, seems to justify its position. In a single specimen I am unable to examine critically the neuration, but it appears to be in all respects similar to *kinkerella*; the wings, however, owing to their very long and closely packed cilia, have a squarer appearance, which makes them look wider in proportion to their length; this, however, is not the case when the shape of the wing itself is examined. In this and the American species (*snellenella*, Wlsm.) the second lobe of the hind wings is somewhat more decidedly developed than in the European type.

TACHYPTILIA, Hein.

TACHYPTILIA DESECTELLA, Z.

Gelechia (Tachyptilia) desectella, Z. Hor. Soc. Ent. Ross. xiii. pp. 362–3, pl. v. fig. 122 (1877).

West Indies—Cuba (*Z.*).

HELCYSTOGRAMMA, Z.

HELCYSTOGRAMMA OBSERATELLA, Z.

Gelechia (Helcystogramma) obseratella, Z. Hor. Soc. Ent. Ross. xiii. pp. 371–3, pl. v. fig. 127 (1877).

West Indies—Cuba (*Z.*).

TRICHOTAPHE, Clem.

TRICHOTAPHE TRIGONELLA, sp. n.

Antennæ brownish fuscous, faintly annulated with paler rings.

Palpi pale whitish ochreous, the extreme point of the apical joint ochreous, with a few fuscous scales preceding it.

Head leaden grey.

Thorax greyish brown, with a distinct whitish-ochreous line from the eyes to the middle of the posterior margin on each side, forming a V-shaped mark, which gives it a triangular appearance.

Fore wings greyish brown, with a small ferruginous spot at the end of the discal cell, margined on its upper and outer side with whitish-ochreous scales; a whitish-ochreous line from the base along the dorsal margin to the bulge of the wing, but not continued where the margin becomes straight; a faint whitish-ochreous spot or group of scales on the extreme costal margin at one fifth from the apex; cilia brownish grey, with a few detached whitish-ochreous scales along their apical margin.

Hind wings brownish grey, with a tuft of greyish-ochreous hairs above at the base; cilia brownish grey, inclining to ochreous at their extreme base.

Abdomen greyish brown; anal tuft whitish ochreous.

Legs whitish ochreous; hind tibiæ lightly touched with brownish grey above the spurs and on the tarsal joints.

Exp. al. 11 millim.

Hab. West Indies—St. Vincent (windward side, 1 specimen, *Smith*).

Type, ♂.

BRACHYCROSSATA, Hein.

BRACHYCROSSATA PSORICOPTERELLA, sp. n.

Antennæ fuscous, faintly annulated with pale cinereous.

Palpi fuscous, speckled with pale cinereous at the ends of the second and apical joints.

Head greyish fuscous above, face paler.

Thorax fuscous.

Fore wings mottled with pale cinereous and fuscous in about equal proportions; the latter predominating along the dorsal half to the anal angle and in two costal patches, the first scarcely before, the the other beyond the middle; there is also a fuscous streak from the costa near the base, and a fuscous spot at the extreme apex followed by a fuscous line around the apical margin but not reaching to the anal angle; cilia reddish grey, inclining to pale ochreous grey on their basal half, especially towards the costal margin. In some specimens the pale ground-colour is equally distributed over the dorsal half of the wing.

Hind wings dark greyish; cilia grey.

Abdomen fuscous, anal tuft paler; underside shining pale cinereous.

Legs: hind legs fuscous, tibiæ clothed above with longish hairs, tarsal joints speckled with very pale ochreous; middle pair of legs conspicuously banded on their outer sides with fuscous and very pale ochreous.

Expl. al. 10 millim.

Hab. West Indies—St. Vincent (windward side, 5 specimens, May, *Smith*).

Type, ♂.

Diastoma, Mschl.

Diastoma squamosa, sp. n.

Antennæ, ♂, strongly ciliated; very pale brownish.

Palpi whitish, with an umber-brown streak at the base on the underside.

Head dirty whitish.

Thorax whitish, with a slight umber-brown tint anteriorly.

Fore wings white, faintly speckled with pale umber-brown; with three dark brown costal marks containing some blackish scales:—the first at one fourth from the base, giving rise to a very inconspicuous sinuate and outwardly oblique line of brownish scales, some of which are raised; the second at about the middle of the wing, also gives rise to an outwardly oblique line of brown scales containing raised blackish tufts, this is developed into a conspicuous spot at the end of the cell, and beneath it nearer to the base is a much smaller spot of similar raised scales, this line is not continued to the dorsal margin; from the third costal spot, which is at three fourths of the wing-length, a more continuous but slender line of mixed brown and black scales, some slightly raised, curves outwards above the middle of the wing and is bent back to the anal angle; beyond it, but below the middle of the apical margin, is a spot of similar colour, above which are a few scattered brownish scales along the margin; cilia whitish, their base indicated by a very faint marginal line.

Hind wings yellowish white, with cilia of the same colour.

Abdomen very pale ochreous, with two yellowish-white tufts arising right and left at its junction with the thorax.

Legs yellowish white.

Exp. al. 19 millim.

Hab. West Indies—St. Vincent (1 specimen, *Smith*).

Type, ♂.

Polyhymno, Chamb.

Polyhymno ? godmani, sp. n.

Antennæ with the basal joint slightly enlarged; pale grey.

Palpi shining pale grey.

Head shining pale grey; face almost white.

Thorax shining pale grey.

Fore wings shining pale reddish grey, without markings to beyond the middle; the apical portion of the wing adorned, first by a bright orange-yellow streak slightly above the middle of the wing extending to the costal margin before the apex as far as a small jet-black apical spot, from which two slender dark lines (which appear to be produced by the iridescent effect of the waved lines of scales rather than by any dark scaling) diverge downwards to the anal angle, these are preceded by a bright silvery-white space which runs obliquely backwards (and appears to be also dark-margined), and followed by the shining lilac metallic cilia, which are gathered into two distinct depressed points at the apex, giving the wing a falcate appearance; the cilia of the dorsal margin and anal angle are reddish grey.

Hind wings shining pale grey; cilia purplish grey, with a distinct black transverse line preceded by a pale space at the extreme apex.

Abdomen shining leaden grey.

Legs very pale ochreous, with a black spot above the spurs; hind tibiæ clothed with long hairs above; hind tarsal joints barred with blackish scales above.

Exp. al. 11 millim.

Hab. West Indies—St. Vincent (Kingstown and windward side, 5 specimens, *Smith*).

Type, ♂.

Additional material should enable this species to be ultimately separated from the genus *Polyhymno*; it agrees in structure with my African *Polyhymno* ? *tenuis* and also with Walker's *Gelechia animosella* from India.

Ypsolophus, F.

Ypsolophus manellus, Mschl.

Ypsolophus manellus, Mschl. Ab. Senck. Nat. Ges. xv. pp. 344–5, 354 (1890).

West Indies—Portorico (*Mschl.*).

Ypsolophus rusticus, sp. n.

Antennæ pale greyish ochreous.

Palpi with a strong triangular tuft, from the middle of which arises the sharp, slender, apical joint; cinereous at the sides, with a paler line along the margin of the tuft.

Head pale greyish ochreous.

Thorax pale ochreous.

Fore wings pale ochreous, with a small fuscous spot at the extreme base of the costal margin and a black discal dot at half the wing-length, followed by a second at two thirds from the base, somewhat nearer the dorsal margin, beneath it is a group of brownish-fuscous scales; one or more groups of fuscous scales on the costal margin before the apex, and a diffused shade of the same colour along the apical margin tapering to the anal angle; cilia pale ochreous.

Hind wings pale greyish with a slight iridescence; cilia pale cinereous.

Abdomen greyish; anal tuft inclining to ochreous.

Legs very pale cinereous.

Exp. al. 12 millim.

Hab. West Indies—St. Vincent (windward side, 2 specimens, *Smith*). United States—Texas (*Belfrage*).

Type, ♂.

I have two specimens collected by the late G. W. Belfrage in Texas, which have been long in my collection as belonging to an undescribed species, but under the suspicion that they might be *Anarsia trimaculella*, Chamb., from which they appear to differ in the absence of a third spot on the fold before the middle.

YPSOLOPHUS PIPERATUS, sp. n.

Antennæ pale cinereous.

Palpi fuscous externally, paler on their inner sides, with a narrow whitish line along the outer margin of the tuft.

Head pale cinereous.

Thorax pale ochreous.

Fore wings pale ochreous, dusted with black scales, especially on the outer half; costa black at the base, dotted unequally with black throughout; apical margin dusted with black; a black discal spot at one fourth from the base above the fold; a second smaller one below it; two black dots towards the end of the cell, the first of which is at about the middle of the wing, the second beyond the middle, below the first of these spots is a small black dot; cilia very pale ochreous.

Hind wings grey with a faint iridescence; cilia pale cinereous.

Abdomen grey.

Legs pale cinereous.

Exp. al. 9 millim.

Hab. West Indies—St. Vincent (windward side, one specimen, *Smith*).

Type, ♂.

YPSOLOPHUS INDIGNUS, sp. n.

Antennæ pale cinereous, faintly annulated.

Palpi rufo-cinereous, with a pale line along the upper margin of the second joint.

Head and *thorax* pale rufo-cinereous.

Fore wings pale rufo-cinerous, with a few chestnut mottlings in some specimens; a blackish discal spot before the middle, another on the fold almost exactly below it, but perhaps a little further removed from the base; a pair of very inconspicuous chestnut-brown spots on each side of the fold near the base, the lower preceding the upper, and another pair at about the end of the cell, sometimes fused into one spot but not conspicuous; a series of five small black triangular dots—three on the apical margin, one on the apex, and one above it; cilia pale rufo-cinereous.

Hind wings reddish grey; cilia grey.

Abdomen greyish; anal tuft slightly paler.

Legs pale cinereous; tarsal joints faintly spotted.

Exp. al. 11 millim.

Hab. West Indies—St. Vincent (Kingstown and windward side, 6 specimens, *Smith*).

Type, ♂.

This appears to be a variable species. The spots are almost obsolete in some specimens, which then appear almost uniform. It is closely allied to *Y. pauciguttellus*, Clem., but is scarcely more than half the size, the hind wings are also somewhat less transparent.

Œcophorinæ.

Psecadia, Hb.

N. Syn. =*Tamarrha*, Wkr. Cat. Lp. Ins. B. M. xxix. p. 816 (1864).

Psecadia confusella, Wkr.

Hyponomeuta confusellus, Wkr. Cat. Lp. Ins. B. M. xxviii. p. 531 (1863).

N. syn. = *Cryptolechia strigosella*, Wkr. Cat. Lp. Ins. B. M. xxix. p. 710 (1864).

Psecadia (*Cryptolechia*) *strigosa*, Ckrl. Jr. Inst. Jamaica, i. 33 (1891).

West Indies—Jamaica (*Wlsm.*), San Domingo (*Wkr.*), Dominica (*Wlsm.*).

Colombia—Bogotá (*Wlsm.*).

This species, which was placed in the genera *Hyponomeuta* and *Cryptolechia* by Walker, should be removed to *Psecadia*. I have specimens from Dominica and Bogotá received from Mr. Druce.

Psecadia ingricella, Mschl.

Psecadia ingricella, Mschl. Ab. Senck. Nat. Ges. xv. pp. 343, 354 (pl.), fig. 19 (1890).

West Indies—Portorico (*Mschl.*), Jamaica (*Wlsm.*).

Psecadia paucella, Wkr.

Hyponomeuta paucellus, Wkr. Cat. Lp. Ins. B. M. xxviii. pp 530–1 (1863).

West Indies—San Domingo (*Wkr.*).

PSECADIA NOTATELLA, Wkr.

Psecadia notatella, Wkr. Cat. Lp. Ins. B. M. xxviii. p. 536 (1863).

N. syn.=*Psecadia xanthorrhoa,* Z. Hor. Soc. Ent. Ross. xiii. pp. 234–6, pl. iii. fig. 71 (1877); Snell. Tijd. v. Ent. xxx. p. 65 (1887); Mschl. Ab. Senck. Nat. Ges. xv. pp. 341, 354 (1890).

West Indies—San Domingo (*Wkr.*), Portorico (*Z.*), Curaçao (*Snell.*).

PSECADIA ABRAXASELLA, Wkr.

Psecadia abraxasella, Wkr. Cat. Lp. Ins. B. M. xxx. pp. 1016–17 (1864).

N. syn.=*Psecadia aureoapicella,* Mschl. Ab. Senck. Nat. Ges. xv. pp. 341–2, 354 (1890).

West Indies—San Domingo (*Wkr.*), Portorico (*Mschl.*), Jamaica (*Wlsm.*).

PSECADIA ADUSTELLA, Z.

Psecadia adustella, Z. Hor. Soc. Ent. Ross. xiii. pp. 240–1 (1877).

West Indies—Portorico (*Z.*).

PSECADIA EXORNATA, Z.

Psecadia exornata, Z. Hor. Soc. Ent. Ross. xiii. pp. 238–240, pl. iii. fig. 73 (1877).

Peru—Chauchamayo (*Z.*).

West Indies—Cuba (*Z.*).

PSECADIA KIRBYI, Mschl.

Psecadia kirbyi, Mschl. Ab. Senck. Nat. Ges. xv. pp. 342–3, 354 (1890).

West Indies—Portorico (*Mschl.*).

PSECADIA GELIDELLA, Wkr.

Tamarrha gelidella, Wkr. Cat. Lp. Ins. B. M. xxix. p. 817 (1864).

West Indies—Jamaica (*Wkr.*).

PSECADIA NIVOSELLA, Wkr.

Tamarrha nivosella, Wkr. Cat. Lp. Ins. B. M. xxix. p. 817 (1864).

West Indies—Jamaica (*Wkr.*), San Domingo (*Wkr.*).

ATYCHIANÆ.

TORTYRA, Wkr.

Tortyra, Wkr. Cat. Lp. Ins. B. M. xxviii. p. 510 (1863).

N. syn.=*Choregia* (Z.), F. & R. Reise Nov., Lp. expl. pl. cxl. (1875); Z. Hor. Soc. Ent. Ross. xiii. pp. 191–2 (1877).

TORTYRA AURIFERALIS, Wkr.

Tortyra auriferalis, Wkr. Cat. Lp. Ins. B. M. xxviii. pp. 510–511 (1863).

N. syn.=*Simæthis aurofasciana,* Snell. Tijd. v. Ent. xviii. pp. 73, 74–76, pl. vi. fig. 7 (1875); Mschl. Ab. Senck. Nat. Ges. xv. pp. 335, 354 (1890).

Simæthis (*Chordates*) *aurofasciana,* Snell. Tijd. v. Ent. xx. pp. 48–49 (1876).

Choregia aurofasciana, Snell. Tijd. v. Ent. xxviii. p. 15 (1885).

N. syn.=*Choregia ignita,* Z. Hor. Soc. Ent. Ross. xiii. pp. 195–6 (1877).

West Indies—San Domingo (*Wkr.*), St. Martin (*Snell.*), Cuba (*Z.*), Portorico (*Mschl.*), St. Vincent (windward side, sea-level, 2 specimens, *Smith*).

It is, I think, more than probable that *Tortyra spectabilis,* Wkr. (Brazil), and *Choregia fulgens,* F. & R. (Colombia), are also varieties of this species; indeed, Zeller indicates the same opinion in naming *Choregia ignita* under his remarks on *Choregia fulgens,* and not under a separate heading. The differences appear to be the generally brighter colouring of the thorax and fore wings, and the small longitudinal black streaks running towards the apex of the wing in the West-Indian form.

Gauris, Hb.

Gauris biferana, Wkr.

Gauris biferana, Wkr. Cat. Lp. Ins. B. M. xxviii. p. 418 (1863).

West Indies—San Domingo (*Wkr.*).

Gauris rimulalis, Z.

Simæthis rimulalis, Z. Ver. z.-b. Ges. Wien, xxv. p. 321 (1875); Hor. Soc. Ent. Ross. xiii. pp. 174–5, pl. ii. fig. 62 (1877).

West Indies—St. Thomas (*Z.*), Cuba (*Z.*).

Choreutinæ.

Brenthia, Clem.

Brenthia pavonacella, Clem.

Brenthia pavonacella, Clem. Proc. Ac. Nat. Sc. Phil. xii. p. 172 (1860); Stn. Tin. N. Am. pp. 38, 41, 134–5 (1872); Mschl. Ab. Senck. Nat. Ges. xv. pp. 335, 354 (1890).

United States, Central America, Brazil.

West Indies—Portorico (*Mschl.*).

Glyphipteryginæ.

Trapeziophora, gen. nov.

(τρᾰπέζιον=an irregular four-sided figure; φορεῖν=to bear.)

Type, ♂ ♀ *Trapeziophora gemmula,* Wlsm.

Antennæ about half the length of the fore wings; simple in both sexes.

Maxillary palpi obsolete.

Labial palpi short, projecting, scarcely recurved; apical joint longer than the second joint.

Haustellum moderate.

Head smooth.

Thorax stout.

Fore wings elongate, subovate, costa somewhat arched beyond the middle, apex rounded, apical margin oblique, rounded. *Neuration*: 12 veins, all separate; 7 and 8 closely approximate at their base; 9 remote from 8; 10 very near 9, and approaching it even more closely where it reaches the costal margin.

Hind wings trapezoidal, of even width throughout, dorsal margin slightly concave, apex rounded, apical margin convex. *Neuration*: 8 veins; 3 and 4 from a point; 6 and 7 separate, but approximate towards their base.

Abdomen somewhat stout.

Legs smooth, spurs unequal.

This genus differs from the ordinary forms of the *Glyphipteryginæ* in having smooth (not hairy) legs, and in the form of the hind wings, which is trapezoidal, but in other respects it appears to fall into the neighbourhood of *Aelocosma*, Meyr.

Trapeziophora gemmula, sp. n. (Plate XLI. fig. 7, *a–b*.)

Antennæ fuscous.

Palpi whitish, doubly barred with black across the second joint and with a black longitudinal line throughout the length of the apical joint beneath.

Head purplish fuscous.

Thorax greyish fuscous.

Fore wings greyish fuscous at the base, blending into bright purple on the apical half of the wing; the basal half irrorated with small whitish shining dots, which run in a series of confused lines, radiating outwards from the base to the middle of the wing; a few similar dots, but of a rather yellower colour, are visible about the middle of the bright purple apical half of the wing; upon this outer half are four distinct shining iridescent metallic bands, with a lilac or green reflexion—the first commencing on the costa, just beyond the middle of the wing, is widened and diffused downwards, but not reaching to the lower margin of the cell; the second is shorter, with a slightly oblique outward direction, and is more remote from the first than are the two beyond it from itself or each other; the third band, commencing on the costa and curving obliquely outwards, is recurved below the middle to the anal angle; beyond it a short fourth band crosses before the apex from the costa to the middle of the apical margin; cilia greyish about the apex, tending to purplish grey about the anal angle. Underside unicolorous purplish fuscous.

Hind wings brown; cilia greyish brown. Underside greyish brown, with three bright metallic transverse streaks near the apex.

Abdomen greyish fuscous; dingy whitish beneath.

Legs banded with black and white.

Exp. al. 11 millim.

Hab. West Indies—St. Vincent (windward side, 2 specimens, *Smith*).

Type, ♂ ♀.

Xyloryctinæ.

Glyphidocera, gen. n.

(γλυφίς=a notch, κέρας=a horn.)

Type, ♂ ♀ *Glyphidocera audax*, Wlsm.

Antennæ: male, slightly serrate, deeply notched on the upperside a little beyond the basal joint; female, simple, having no notch, but the outer end of the basal joint is somewhat enlarged.

Maxillary palpi obsolete.

Labial palpi long, recurved, clothed with closely appressed scales; apical joint acuminate, rather more than half the length of the second joint.

Head densely clothed above; face smooth.

Thorax smooth.

Fore wings narrow, elongate, depressed, and rounded at the apex, slightly arched at the extreme base of the costa, costal and dorsal margins parallel, anal angle rounded. *Neuration*: 11 veins; 2 and 3 from a recurved common stem; 7 closely approximate to 8 at base, running to apical margin below apex, 8 to costal margin.

Hind wings more than twice the breadth of the fore wings, slightly rounded at the apex, outer margin evenly rounded to the abdominal angle; cilia short and even. *Neuration*: 8 veins; 3 and 4 from a short common stem; 5 straight, moderately remote from origin of 3+4; 6 and 7 from a common stem; 8 joined to upper margin of cell by a cross vein.

Legs: posterior pair with unequal spurs; tibiæ moderately clothed.

It seems at present impossible to arrive at the affinities of this genus; the notched antennæ would suggest *Blastobasis*, Z., and *Holcocera*, Clem., from which it differs widely in neuration and the shape of the hind wings. Its neuration conforms to the *Xyloryctidæ*, Meyr., from which it is separated by the absence of a tuft of hair-like scales near the base of the hind wings; nevertheless it will be excusable perhaps to place it in this family, at least provisionally.

Glyphidocera audax, sp. n. (Plate XLI. fig. 8, *a–c*.)

Antennæ subochreous.

Palpi fawn-brown, dusted with fuscous.

Head and *thorax* fawn-brown.

Fore wings dull fawn-brown, densely irrorated with fuscous scales throughout; with an elongate transverse fuscous spot before the middle, of which the lower extremity touches the fold; a smaller fuscous spot at the end of the cell; a few fuscous scales about the apical margin indicate the extremities of the veins; cilia pale fawn-brown, with a darker line along their middle.

Hind wings cinereous, with a slight fawn-brown shade from the base above their middle; a narrow inconspicuous subfuscous band across the extreme apex; cilia cinereous, with a slender paler line along their base.

Abdomen cinereous.

Legs pale cinereous; hind tarsal joints unspotted.

Exp. al. 16 millim.

Hab. West Indies—St. Vincent (windward side, 2 specimens, *Smith*).

Type, ♂ ♀.

Hyponomeutinæ.

Hyponomeuta, Z.

Hyponomeuta mahalebellus, Gn.

Yponomeuta mahalebella, Gn. Ind. Meth. p. 105 (1845); id. Ann. Soc. Ent. Fr. (5 s.) ix. p. 282 (1879).

Hyponomeuta mahalebellus, Stgr. & Wk. Cat. Lp. Eur. (ii.) no. 1555, p. 277 (1871).

Europe.

West Indies—Cuba (*Gn.*).

Hyponomeuta triangularis, Mschl.

Hyponomeuta triangularis, Mschl. Ab. Senck. Nat. Ges. xv. pp. 339–40, 354 (1890).

West Indies—Portorico (*Mschl.*).

Œta, Grt.

Œta punctella, Cram.

Phalæna (*Tinea*) *punctella,* Cram. Pap. Exot. iv. p. 164, pl. ccclxxii. fig. L (1782).

= *Œta compta,* Grt. Proc. Ent. Soc. Phil. v. pp. 230–1 (1865).

= *Scintilla pustulella,* Gn. Ann. Soc. Ent. Fr. (5 s.) ix. pp. 287–8 (1879); Berg, Ann. Soc. Ci. Argent. x. pp. 100–2 (1880).

Œta punctella, Z. Ver. z.-b. Ges. Wien, xxiii. pp. 228–9 (1873).

Larva: *Ailanthus glandulosa.*

United States, Honduras, Surinam, French Guiana, Argentine Republic, Brazil.

West Indies—Trinidad (*Wlsm.*).

I have a specimen from Trinidad received from Mr. Crowfoot. Walker [Cat. Lp. Ins. B. M. xxxv. p. 1894 (1866)] records this species from India, thus:—" *c.* Himalaya Mts. Presented by the Entomological Club." This specimen is labelled "Honduras"!

Œta fulviguttella, Z.

Œta fulviguttella, Z. Ver. z.-b. Ges. Wien, xxiii. pp. 231–2 (1873).

= *Syblis glaucopidella,* Gn. Ann. Soc. Ent. Fr. (5 s.) ix. p. 289 (1879); Berg, An. Soc. Ci. Argent. x. pp. 106–7 (1880).

(? Australia, *Z.*)

West Indies—Jamaica (*Gn.*).

Œta fastuosa, Z.

Œta fastuosa, Z. Hor. Soc. Ent. Ross. xiii. pp. 225–7, pl. iii. fig. 68 (1877); Berg, An. Soc. Ci. Argent. x. p. 109 (1880).

West Indies—Cuba (*Z.*).

Œta siderea, sp. n.

Antennæ slightly serrate; grey-brown.

Palpi blackish, with a white ring around the junction of the second and apical joints.

Head white above, face with a black cross band.

Thorax purplish in front and behind, with a large shining golden-yellow patch on each side (possibly joined in the middle, where my specimen is pinned); tegulæ shining golden-grey.

Fore wings purplish blue, a golden-yellow spot at the extreme base scarcely separated from the costal margin; beyond it an elongate spot of the same colour reaching to two thirds of the wing-length; a round golden-yellow spot on the middle of the dorsal margin, with a smaller one above and beyond it; beneath the costal margin a broad sinuate golden-yellow band from immediately before the apex reaches to the anal angle, leaving the apical margin of the purplish ground-colour, which is profusely irrorated throughout with round snow-white spots; cilia purplish grey. Underside brownish grey.

Hind wings brownish grey, semitransparent, with a strong iridescent sheen, especially about the middle. Underside brownish grey.

Abdomen brownish grey, a series of paler spots along its upper side.

Legs purplish grey barred with white.

Exp. al. 19 millim.

Hab. West Indies—San Domingo.

Type, ♀ Mus. Wlsm.

This specimen was kindly given me by Dr. Fernald in 1884.

Euarne, Mschl. & Saalm.

Euarne obligatella, Mschl.

Euarne obligatella, Mschl. Ab. Senck. Nat. Ges. xv. pp. 340, 354 (1890).

West Indies—Portorico (*Mschl.*).

Trichostibas, Z.

Trichostibas calligera, Z.

Trichostibas calligera, Z. Hor. Soc. Ent. Ross. xiii. pp. 231–2 (1877).

West Indies—Cuba (*Z.*).

Trichostibas ovata, Z.

Trichostibas ovata, Z. Hor. Soc. Ent. Ross. xiii. p. 233 (1877).

West Indies—Cuba (*Z.*).

TRICHOSTIBAS SORDIDATA, Z.

Trichostibas sordidata, Z. Hor. Soc. Ent. Ross. xiii. pp. 233–4 (1877).

West Indies—Portorico (*Z.*).

TRICHOSTIBAS ? IOPHLEBIA, Z.

Trichostibas iophlebia, Z. Hor. Soc. Ent. Ross. xiii. pp. 228–9, pl. iii. fig. 69 (1877).

West Indies—Antilles (*Z.*).

If the neuration, which is partly given in the figure, is correct, this species cannot be a *Trichostibas*, but must be allied to *Cydosia nobilitella*, Cram., the type of Smith's *Cydosiinæ*, which would necessitate its removal from the *Tineidæ*.

BUTALINÆ.

AUXIMOBASIS, gen. nov.

(*αὔξιμος*=promoting growth ; *βάσις*=the base.)

Type, ♂ ♀ *Auximobasis persimilella*, Wlsm.

Antennæ with the basal joint enlarged, flattened, not notched, with a small pecten in front.

Maxillary palpi small.

Labial palpi smooth, recurved to the top of the head ; apical joint slender, more than half the length of the second joint.

Haustellum scaled.

Head smooth.

Thorax stout, smooth.

Fore wings elongate, lanceolate, slightly rounded at the apex, costal margin nearly straight, dorsal margin bulged at the base, straight beyond. *Neuration*: 12 veins; 2, 3, and 4 very short ; 7 and 8 form a common stem to above apex.

Hind wings nearly as wide as the fore wings ; lanceolate, tapering outwards, widest at the abdominal margin ; cilia long. *Neuration* : 8 veins ; 3 from the lower angle of cell, 4 and 5 forked out of 3 from near its base ; 6 and 7 separate.

Legs : hind tibiæ densely clothed.

AUXIMOBASIS PERSIMILELLA, sp. n. (Plate XLI. fig. 9, *a–c*).

Antennæ cinereous, basal joint hoary.

Palpi cinereous, stained with fuscous externally nearly to the apex of the second joint.

Head hoary cinereous.

Thorax hoary cinereous.

Fore wings hoary cinereous, sprinkled with fuscous scales ; an ill-defined slightly outcurved fuscous band scarcely before the middle of the wing from the costal to the dorsal margin ; a pair of fuscous dots beyond the end of the cell, and a slight angulated fuscous shade before the apex running parallel to the margin of the wing (in some specimens these markings are almost obsolete); cilia cinereous.

Hind wings greyish; cilia cinereous.

Abdomen cinereous, faintly banded with a deeper shade.

Legs: hind tibiæ fuscous, externally clothed above with pale cinereous hairs; spurs and tarsal joints pale cinereous.

Exp. al. 10–12 millim.

Hab. West Indies—St. Vincent (Kingstown, 2 specimens; windward side, 6 specimens, *Smith*).

Type, ♂ ♀.

In markings this species is scarcely distinguishable from a small specimen of *Blastobasis phycidella*, Z., but the absence of an antennal notch and the neuration of the hind wings at once distinguish it. It is the only form allied to *Blastobasis* that I have yet met with in which veins 3 and 4 of the hind wings proceed from a stalk out of 3 instead of coming direct from the edge of the cell; the whole group is an exceedingly difficult one, and the multiplication of genera founded on good structural differences, however slight, can only facilitate their future classification, especially as the species are at least as difficult to separate by pattern and markings as are the genera.

Heliodininæ.

Heliodines, Stn.

Heliodines marginata, sp. n.

Antennæ simple, as long as the fore wings; sooty brown.

Palpi short, slender, dependent; sooty brown.

Head and *thorax* sooty brown; underside of the thorax with a conspicuous orange yellow spot on each side.

Fore wings shining orange-yellow, very narrowly margined throughout with sooty brown, which is diffused over the extreme apex; a single lilac shining metallic spot lies on the costal margin near the base; there are two slender, but by no means conspicuous, streaklets of the same colour—one along the base of the cilia about the region of the anal angle, the other much shorter, above and parallel to it, forming a short tooth-like projection inwards from the middle of the suffused dark apical portion of the wing; cilia sooty brown. Underside unicolorous greyish brown.

Hind wings deep brown; cilia sooty brown. Underside unicolorous greyish brown.

Abdomen and *legs* sooty brown.

Exp. al. 8 millim.

Hab. West Indies—St. Vincent (windward side, 1 specimen, *Smith*).

Type, ♂.

CosmopterygINÆ.

Cosmopteryx, Hb.

Cosmopteryx lespedezæ, Wlsm.

Cosmopteryx lespedezæ, Wlsm. Tr. Am. Ent. Soc. x. p. 198 (1882).

Larva on *Lespedeza* (in U.S., *Wlsm.*).

United States—Texas, N. Carolina.

West Indies—St. Vincent (Kingstown and windward side, 4 specimens, *Smith*).

Cosmopteryx (? gemmiferella, Clem.), Mschl.

Cosmopteryx gemmiferella, Clem. Proc. Ac. Nat. Sc. Phil. xii. p. 10 (1860); Stn. Tin. N. Am. pp. 39, 100–1 (1872).

Cosmopteryx (? *gemmiferella,* Clem.), Mschl. Ab. Senck. Nat. Ges. xv. pp. 345, 354 (1890).

Larva on *Zizania miliacea,* April and June (in U.S., *F. & B.*).

United States—Texas, Pennsylvania.

West Indies—Portorico (*Mschl.*).

Cosmopteryx sancti-vincentii, sp. n.

Antennæ brown, with a slender white line along each side reaching to a white ring around the eighth joint from the apex; apical joint white.

Palpi brownish, with slender whitish lines throughout their length above and beneath.

Head brown.

Thorax brown, with a slender longitudinal central white streak.

Fore wings brown to a little beyond the middle, apex brown, separated from the basal half by a broad pale yellow band; on the basal half are four distinct slender white longitudinal lines—the first along the costal margin from the base to the yellow band, sometimes slightly interrupted about its middle; a second from near the base above the fold parallel with the first and about two thirds its length; a third below the outer half of the fold, short, commencing at one half the length of the brown basal half and not reaching the yellow band; a fourth along the dorsal margin reaching to a point opposite the commencement of the third; the brown basal half is bordered obliquely by two spots of raised pale golden scales, sometimes connected, the upper spot being slightly nearer to the base than the lower one, at the outer edge of the upper spot is a minute dot of jet-black scales; at the outer edge of the broad yellow band are two opposite pale golden spots, the one costal, the other, which is the larger, dorsal; between these spots the yellow colour of the band is continued for a small space and emits into the brown apical part of the wing a slender straight golden-yellowish line to the extreme apex; a few whitish scales on the costa form an outer margin to the second pale golden-yellow costal spot; cilia greyish brown.

Hind wings greyish brown, cilia the same.

Abdomen brownish cinereous, pale beneath.

Legs brownish, spotted on the spurs and tarsal joints with silvery white.

Exp. al. 10 millim.

Hab. West Indies—St. Vincent (Kingstown and windward side, 2 specimens, *Smith*).

Type, ♂ ♀.

Laverninæ.

Anybia, Stn.

Anybia conspersa, sp. n.

Antennæ with the basal joint somewhat enlarged outwardly; greyish fuscous, the last eight or nine joints at the apex whitish ochreous.

Palpi recurved to above the base of the antennæ; apical and second joints about equal in length; dark fuscous, externally delicately stippled with cinereous scales.

Head greyish fuscous; face pale cinereous.

Thorax greyish fuscous, speckled with pale cinereous, especially at the sides.

Fore wings narrow, elongate, tapering, acuminate, with long cilia; cinereous, thickly clouded and sprinkled with fuscous; a slight chestnut-brown shade near the base, adjacent to but below the fold; a few chestnut scales also above the fold halfway to the costal margin; dorsal margin thickly clouded with fuscous throughout; a small fuscous dot lies at the end of the cell on the middle of the wing, and indeed over the whole wing-surface the dark scaling predominates; cilia greyish cinereous.

Hind wings very narrow, less than half the width of the fore wings; with very long cilia; brownish grey; cilia greyish cinereous.

Abdomen greyish cinereous; anal tuft subochreous.

Legs: hind tibiæ fringed above; pale ochreous on their inner and under sides, greyish fuscous externally; hind tarsal joints faintly spotted with pale cinereous, a small pale ochreous spot above the first pair of spurs.

Exp. al. 11–12 millim.

Hab. West Indies—St. Vincent (Kingstown and windward side, 3 specimens, *Smith*).

Type, ♀.

The genus *Anybia* is represented in Europe by a single species, with which I have very carefully compared the two now described; the neuration is undoubtedly similar and the very slight difference in the more recurved palpi is quite insufficient to separate them, especially as the comparative lengths of the joints with their closely appressed scales precisely agree with the type. It is remarkable that this genus should not have been recorded from other localities, since its presence in the West Indies indicates the probability of a wider distribution.

ANYBIA CURVIPUNCTELLA, sp. n.

[*Antennæ* wanting.]

Palpi recurved to base of antennæ, apical joint as long as the second; purplish fuscous.

Head purplish fuscous; face shining pale cinereous.

Thorax purplish fuscous.

Fore wings purplish fuscous, with a semicircular pale ochreous spot on the outer third of the fold, which runs through the middle of it, its concavity being towards the base; two minute very pale ochreous spots—one costal, the other dorsal—opposite to each other at about one fifth from the apex; cilia purplish fuscous at the apex, pale cinereous on the dorsal margin below it.

Hind wings very narrow; pale greyish; cilia pale cinereous with a faint ochreous tinge.

Abdomen greyish cinereous.

Legs purplish fuscous externally, very pale ochreous internally; posterior tibiæ fringed above with very pale ochreous hairs; a pale ochreous spot at the base of the spurs and some pale ochreous spots on the posterior tarsal joints.

Exp. al. 8 millim.

Hab. West Indies—St. Vincent (windward side, 1 specimen, *Smith*).

Type, ♀.

A much smaller species than *conspersa*, and at once distinguished by the pale ochreous spot on the fold.

BATRACHEDRINÆ.

BATRACHEDRA, Stn.

BATRACHEDRA ALBISTRIGELLA, Mschl.

Batrachedra albistrigella, Mschl. Ab. Senck. Nat. Ges. xv. pp. 345, 354 (1890).

West Indies—Portorico (*Mschl.*).

ZARATHRA, Wkr.

ZARATHRA INSULELLA, sp. n.

Antennæ half as long again as the fore wings; basal joint very slightly enlarged; pale yellowish.

Maxillary palpi slightly folded.

Labial palpi very long, recurved, slender, acuminate; apical joint slightly longer than the second; white.

Head thickly clothed with appressed scales, projecting in front at the sides of the face; shining whitish with an aureous tinge.

Thorax pale yellowish.

Fore wings shining pale straw-colour, with an aureous streak extending from the base along the middle and spreading over the costal margin beyond the middle of the wing, and crossing the fold towards the dorsal margin in two diffused spots, the first near the base, the other about the middle; immediately before the apex is a slender shining leaden-grey semicircular line bulging outwards from the costal and recurved to the dorsal margin about the anal angle; at the apex is a conspicuous black spot, from which a curved black line runs through the cilia towards the anal angle, but is ended abruptly before reaching it; between this and the semicircular shining line already mentioned is an oblique straight black line following the margin of the wing at the base of the cilia and reaching upwards nearly to the costo-apical spot; cilia tipped with black at the extreme apex, those on the hind margin pale reddish grey. Underside brownish fuscous.

Hind wings grey; cilia pale reddish grey.

Abdomen reddish grey.

Legs: hind tibiæ fringed above with separate pale yellowish hairs, giving a pectinate appearance; a black spot lies at the base of the spurs and three black bands on the tarsal joints, which are otherwise white.

Exp. al. 9 millim.

Hab. West Indies—St. Vincent (3 specimens, *Smith*).

Type, ♂.

This species is closely allied to *Gracilaria leuconota*, Z., from Ubaque, which also probably belongs to this genus; the species now described differs chiefly in the larger dark apical spot, which is placed nearer to the costal margin, and in the presence of the oblique black streak below it. I am justified in separating it from the genus *Gracilaria* on account of its much longer antennæ and its slender long recurved palpi; the maxillary palpi, although undoubtedly present in the typical *Zarathra*, are not quite so strongly developed as in this species, but the shape of the wings is the same, and, so far as I can judge without denuding the specimen, the general pattern of neuration is similar. This genus is not confined to South America, but extends also to Africa and the Indian region.

GRACILARIANÆ.

GRACILARIA, Hw.

GRACILARIA ÆNEOCAPITELLA, sp. n.

Antennæ greyish, faintly spotted with paler colour.

Palpi whitish, outer half of second joint fuscous, except at the extreme apex.

Head shining iridescent bronze; face shining metallic whitish.

Thorax shining bronzy.

Fore wings tawny purplish, mixed with pale lemon-yellow beyond the basal fourth; a conspicuous broad pale lemon-yellow band extends from the basal third along the costal portion of the wing to the apex, its margin not clearly defined, the tawny purple blending into it from below; this band is widest and most conspicuous about its commencement, where it contains one or two minute fuscous costal dots; a series of dark purple striæ is also visible along the dorsal margin, and some small groups of fuscous scales are on the apical portion of the wing, reaching to the extreme apex; cilia at apex and beneath it pale yellowish sprinkled with fuscous, on the dorsal margin grey.

Hind wings grey, with cilia of the same colour.

Abdomen grey ; shining creamy white beneath.

Legs: anterior and median pair with bronzy-brown tibiæ and white tarsal joints ; posterior pair shaded above with bronzy brown, tarsal joints whitish.

Exp. al. 12 millim.

Hab. West Indies—St. Vincent (windward side, 1 specimen, *Smith*).

Type, ♂.

GRACILARIA APICEPUNCTELLA, sp. n.

Antennæ with the basal joint slightly enlarged ; longer than the fore wings ; very pale cinereous.

Palpi rather long, dependent, slender ; second joint cinereous, with a darker spot on its outer side at the apex ; apical joint about equal in length to the second, whitish, with a dark spot rather before the middle on its outer side.

Head very pale cinereous ; face whitish.

Thorax dirty whitish.

Fore wings greyish fuscous, obliquely barred with interrupted creamy-white bands along the dorsal half of the wing ; a round black apical spot enclosed in a pale ferruginous apical space, which is narrowly black-margined, its anterior margin straight, its posterior margin following the base of the cilia around the apex and apical margin to the anal angle ; the creamy-white bands and markings are distributed as follows :—near the base a small square dorsal spot ; beyond it before the middle a larger spot tending obliquely outwards towards a small subcostal spot before the middle, between which and the base is a second smaller subcostal spot ; a narrow line from before the middle runs along the dorsal margin, and is dilated beyond the middle into a large trapezoidal dorsal patch, which reaches to the inner margin of the pale ferruginous apical space, and diverted to the costa by a narrow line internally and externally dark-margined, its external margin being the blackish inner margin of the ferruginous space already mentioned ; before this narrow line are three short longitudinal streaks, the middle one almost or quite communicating with a short oblique subcostal streak beyond the middle, near the costal end of which another oblique separate streak arises, which tends backward towards the dorsal margin, terminating above the origin of the narrow dorso-marginal line before the middle of the wing-length ; cilia pale greyish tipped with black, on the dorsal margin pale greyish.

Hind wings and cilia greyish.

[*Abdomen* missing.]

Exp. al. 8 millim.

Hab. West Indies—St. Vincent (windward side, 1 specimen, *Smith*).

Type, ♀.

The following species do not belong to the families dealt with in this paper:—

Grapholitha? subapicana, Wkr. Cat. Lp. Ins. B. M. xxviii. pp. 387–8 (1863).

West Indies—San Domingo (*Wkr.*).

Galasa rubidana, Wkr. Cat. Lp. Ins. B. M. xxxv. p. 1802 (1866).
West Indies—Jamaica (*Wkr.*).

Eggyna submutata, Wkr. Cat. Lp. Ins. B. M. xxxv. pp. 1895–6 (1866).

West Indies—San Domingo (*Wkr.*).

Cydosia nobilitella, Cram. Pap. Exot. iii. p. 128, pl. cclxiv. fig. G (1779).

South America, Central America.
West Indies.

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Table of Distribution.

	West Indies.										Other Localities.
	Cuba.	Jamaica.	Haiti or San Domingo.	Portorico.	St. Thomas.	St. Martin.	Dominica.	St. Vincent.	Trinidad.	Curaçao.	
PTEROPHORIDÆ.											
AGDISTINÆ.											
1. Scoptonoma, *Z.*											
1. tipuloides, *Wlsm.*									*		
PTEROPHORINÆ.											
2. Trichoptilus, *Wlsm.*											
2. centetes, *Meyr.*								*			New Guinea, Australia, (? Ceylon).
3. Platyptilia, *Hb.*											
3. pusillidactylus, *Wkr.*		*			*						
4. sp., *Snell.*										*	
4. (? Stenoptilia, *Hb.*)											
5. pumilio, *Z.*)								*			United States.
5. Alucita, *L.*											
6. thomæ, *Z.*					*						
7. basalis, *Mschl.*				*							
8. paleaceus, *Z.*				*							United States.
9. bipunctatus, *Mschl.*				*							
10. participatus, *Mschl.*				*							
11. præustus, *Mschl.*				*							
6. Pterophorus, *Geoffr.*											
12. agraphodactylus, *Wkr.*			*								
13. aspilodactylus, *Wkr.*		*									
14. sp., *Mschl.*				*							
ORNEODINÆ.											
7. Orneodes, *Latr.*											
15. eudactyla, *F. & R.*				*							Colombia, Brazil.

TABLE (*continued*).

	West Indies.										
	Cuba.	Jamaica.	Haiti or San Domingo.	Portorico.	St. Thomas.	St. Martin.	Dominica.	St. Vincent.	Trinidad.	Curaçao.	Other Localities.
TORTRICIDÆ.											
TORTRICINÆ.											
8. APINOGLOSSA, *Mschl. & Saalm.*											
16. comburana, *Mschl.*	...	...	...	*							
9. CACŒCIA, *Hb.*											
17. jamaicana, *Wkr.*	...	*									
10. (TORTRIX, *L.*).											
18. effoetana, *Mschl.*	...	...	...	*							
19. insignitana, *Mschl.*	...	...	...	*							
11. PTYCHAMORBIA, *Wlsm.*											
20. catenana, *Wlsm.*	...	...	...	...	...	...	...	*	...	...	Brazil.
12. PLATYNOTA, *Clem.*											
21. rostrana, *Wkr.*	...	...	*	...	...	...	...	*	...	...	Florida, Venezuela, Brazil.
22. repandana, *Wkr.*	...	...	*								
13. CERATORRHINETA, *Z.*											
23. calidana, *Z.*	*										
CONCHYLIDINÆ.											
14. CONCHYLIS, *Tr.*											
24. lacteipalpis, *Wlsm.*	...	...	...	...	...	...	...	*			
25. prolectana, *Mschl.*	...	...	...	*							
26. tectonica, *Mschl.*	...	...	...	*							
27. vicinitana, *Mschl.*	...	...	...	*							
28. bunteana, *Robs.*	...	...	...	...	...	...	...	*	...	...	United States
29. sp., *Wlsm.*	...	...	...	...	...	...	...	*			
30. sp., *Wlsm.*	...	...	...	...	...	...	...	*			
GRAPHOLITHINÆ.											
15. BACTRA, *Stph.*											
31. lanceolana, *Hb.*	...	...	...	...	...	...	...	*	...	...	Europe, Africa, Asia, Australia. New Zealand, United States.
16. EPISIMUS, *Wlsm.*											
transferrana, *Wkr.*	...	...	...	...	...	...	...	..	...	...	Brazil.
32. *var.* vincentana, *Wlsm.*	...	...	...	...	...	...	...	*			
33. augmentana, *Z.*	*										
17. CACOCHARIS, *Wlsm.*											
34. albimacula, *Wlsm.*	...	...	...	...	...	...	...	*			
18. PHOXOPTERIS, *Tr.*											
35. virididorsana, *Mschl.*	...	...	...	*							
19. GRAPHOLITHA, *H.-S.*											
36. livens, *Wlsm.*	...	...	...	...	...	...	...	*			
37. excitana, *Mschl.*	...	...	...	*							

TABLE (*continued*).

	West Indies.										
	Cuba.	Jamaica.	Haiti or San Domingo.	Portorico.	St. Thomas.	St. Martin.	Dominica.	St. Vincent.	Trinidad.	Curaçao.	Other Localities.
GRAPHOLITHINÆ (continued).											
20. (? Coptoloma, *Ld.*)											
38. figurana, *Z.*					*						
39. albicapitana, *Wlsm.*								*			
21. Pædisca, *Tr.*											
40. longipalpana, *Mschl.*				*							
22. Crocidosema, *Z.*											
41. plebeiana, *Z.*								*			Europe, Australia, Brazil, Peru, Argentine Republic.
23. Strepsicrates, *Meyr.*											
42. smithiana, *Wlsm.*								*			
24. Heligmocera, *Wlsm.*											
43. calvifrons, *Wlsm.*								*			
TINEIDÆ.											
TINEINÆ.											
25. Tinea, *L.*											
44. plumella, *Wlsm.*								*			
45. sp., *Wlsm.*								*			
46. ? sp., *Btl.*		*									
DENDRONEURINÆ.											
26. Dendroneura, *Wlsm.*											
47. præstans, *Wlsm.*								*			
SETOMORPHINÆ.											
27. Setomorpha, *Z.*											
48. rupicella, *Z.*	*										
ANAPHORINÆ.											
28. Eulepiste, *Wlsm.*											
49. umbratipalpis, *Wlsm.*			*								
29. Acrolophus, *Poey.*											
50. vitellus, *Poey*	*			*							
51. poeyi, *Wlsm.*								*			
52. niveipunctata, *Wlsm.*	*										
53. plumifrontellus, *Clem.*	*			*							United States.
54. walsinghami, *Mschl.*				*							
55. leucodocis, *Z.*	*										(? Brazil.)
30. Cænogenes, *Wlsm.*											
56. pusilla, *Z.*							*				Colombia.
57. ochracea, *Mschl.*				*							

TABLE (*continued*).

	West Indies.										Other Localities.
	Cuba.	Jamaica.	Haiti or San Domingo.	Portorico.	St. Thomas.	St. Martin.	Dominica.	St. Vincent.	Trinidad.	Curaçao.	
ANAPHORINÆ (continued).											
31. ANAPHORA, *Clem.*											
58. popeanella, *Mschl.*				*							United States.
59. arcasalis, *Wkr.*			*								
60. mimasalis, *Wkr.*			*								
61. noctuina, *Wlsm.*	*										
32. FELDERIA, *Wlsm.*											
62. dimidiella, *Wlsm.*	*										
33. BAZIRA, *Wkr.*											
63. xylinella, *Wkr.*		*									
EUPLOCAMINÆ.											
34. AMYDRIA, *Clem.*											
64. anaphorella, *Wlsm.*								*			
35. MYRMECOZELA, *Z.*											
65. ochraceella, *Tengstr.*				*							Europe.
36. TIQUADRA, *Wkr.*											
66. aspera, *Z.*				*							
67. lentiginosa, *Z.*									*		Brazil, Peru.
68. sp., *Wlsm.*							*				
37. PENICNEMIDIA, *Mschl.*											
69. mirella, *Mschl.*				*							
PLUTELLINÆ.											
38. PLUTELLA, *Schrk.*											
70. cruciferarum, *Z.*				*							Europe, Asia, Africa, North America, South America, Australia.
GELECHIANÆ.											
39. GELECHIA, *Z.*											
71. donatella, *Wkr.*		*									
72. robustella, *Wkr.*			*								
73. attenuatella, *Wkr.*		*									
74. exclarella, *Mschl.*				*							
75. costipunctella, *Mschl.*				*							
76. rivulella, *Mschl.*				*							
77. cinereocervina, *Wlsm.*								*			
78. sp., *Snell.*										*	
79. ? sp., *Snell.*										*	
40. BRYOTROPHA, *Hein.*											
80. translucida, *Wlsm.*							*	*			
81. sp., *Wlsm.*								*			

TABLE (*continued*).

	West Indies. Cuba.	Jamaica.	Haiti or San Domingo.	Portorico.	St. Thomas.	St. Martin.	Dominica.	St. Vincent.	Trinidad.	Curaçao.	Other Localities.
GELECHIANÆ (continued).											
41. LITA, *Tr.*											
82. crocipunctella, *Wlsm.*	...	...	...	...	...	...	...	*			
42. PŒCILIA, *Hein.*											
83. extranea, *Wlsm.*	...	...	...	...	...	..	...	*			
43. DIDACTYLOTA, *Wlsm.*											
84. bicolor, *Wlsm.*	...	...	...	...	...	...	...	*			
44. TACHYPTILIA, *Hein.*											
85. desectella, *Z.*	*										
45. HELCYSTOGRAMMA, *Z.*											
86. obseratella, *Z.*	*										
46. TRICHOTAPHE, *Clem.*											
87. trigonella, *Wlsm.*	...	...	...	...	...	...	...	*			
47. BRACHYCROSSATA, *Hein.*											
88. psoricopterella, *Wlsm.*	...	...	...	...	...	...	...	*			
48. DIASTOMA, *Mschl.*											
89. squamosa, *Wlsm.*	...	...	...	...	...	...	...	*			
49. POLYHYMNO, *Chamb.*											
90. godmani, *Wlsm.*	...	...	...	...	...	...	...	*			
50. YPSOLOPHUS, *Z.*											
91. manellus, *Mschl.*	...	...	...	*							
92. rusticus, *Wlsm.*	...	...	...	...	...	...	...	*	...	...	United States.
93. piperatus, *Wlsm.*	...	...	...	...	...	...	...	*			
94. indignus, *Wlsm.*	...	...	...	...	...	...	...	*			
ŒCOPHORINÆ.											
51. PSECADIA, *Hb.*											
95. confusella, *Wkr.*	...	*	*	...	...	...	*	...	...	...	Colombia.
96. ingricella, *Mschl.*	...	*	...	*							
97. paucella, *Wkr.*	...	...	*								
98. notatella, *Wkr.*	...	...	*	*	...	...	...	...	...	*	
99. abraxasella, *Wkr.*	...	*	*	*							
100. adustella, *Z.*	...	...	...	*							
101. exornata, *Z.*	*	...	...	...	...	...	...	...	...	...	Peru.
102. kirbyi, *Mschl.*	...	...	...	*							
103. gelidella, *Wkr.*	...	*									
104. nivosella, *Wkr.*	...	*	*								
ATYCHIANÆ.											
52. TORTYRA, *Wkr.*											
105. auriferalis, *Wkr.*	*	...	*	*	...	*	...	*			
53. GAURIS, *Hb.*											
106. biferana, *Wkr.*	...	...	*								
107. rimulalis, *Z.*	*	...	...	...	*						

TABLE (*continued*).

	West Indies.										Other Localities.
	Cuba.	Jamaica.	Haiti or San Domingo.	Portorico.	St. Thomas.	St. Martin.	Dominica.	St. Vincent.	Trinidad.	Curaçao.	
CHOREUTINÆ.											
54. BRENTHIA, *Clem.*											
108. pavonacella, *Clem.*				*							United States, Central America, Brazil.
GLYPHIPTERYGINÆ.											
55. TRAPEZIOPHORA, *Wlsm.*											
109. gemmula, *Wlsm.*								*			
XYLORYCTINÆ.											
56. GLYPHIDOCERA, *Wlsm.*											
110. audax, *Wlsm.*								*			
HYPONOMEUTINÆ.											
57. HYPONOMEUTA, *Z.*											
111. mahalebellus, *Gn.*	*										Europe.
112. triangularis, *Mschl.*				*							
58. ŒTA, *Grt.*											
113. punctella, *Cram.*									*		United States, Honduras, Surinam, French Guiana, Brazil, Argentine Republic.
114. fulviguttella, *Z.*		*									(? Australia, *Z.*)
115. fastuosa, *Z.*	*										
116. siderea, *Wlsm.*			*								
59. EUARNE, *Mschl. & Saalm.*											
117. obligatella, *Mschl.*				*							
60. TRICHOSTIBAS, *Z.*											
118. calligera, *Z.*	*										
119. ovata, *Z.*	*										
120. sordidata, *Z.*				*							
121. ? iophlebia, *Z.*											Antilles (*Z.*).
BUTALINÆ.											
61. AUXIMOBASIS, *Wlsm.*											
122. persimilella, *Wlsm.*								*			
HELIODININÆ.											
62. HELIODINES, *Stn.*											
123. marginata, *Wlsm.*								*			

TABLE (*continued*).

	West Indies.										Other Localities.
	Cuba.	Jamaica.	Haiti or San Domingo.	Portorico.	St. Thomas.	St. Martin.	Dominica.	St. Vincent.	Trinidad.	Curaçao.	
COSMOPTERYGINÆ.											
63. COSMOPTERYX, *Hb.*											
124. lespedezæ, *Wlsm.*	...	...	...	...	...	...	...	*	...	...	United States.
125. (? gemmiferella, *Clem.*) *Mschl.*	...	...	...	*	...	...	...	...	...	...	United States.
126. sancti-vincentii, *Wlsm.*..	...	...	...	...	...	...	...	*			
LAVERNINÆ.											
64. ANYBIA, *Stn.*											
127. conspersa, *Wlsm.*	...	...	...	...	...	...	...	*			
128. curvipunctella, *Wilsm.*	...	...	...	..	...	...	...	*			
BATRACHEDRINÆ.											
65. BATRACHEDRA, *Stn.*											
129. albistrigella, *Mschl.* ...	..	...	...	*							
66. ZARATHRA, *Wkr.*											
130. insulsella, *Wlsm.*	...	...	...	...	...	...	...	*			
GRACILARIANÆ.											
67. GRACILARIA, *Hw.*											
131. æneocapitella, *Wlsm.* .	...	...	...	..	...	...	...	*			
132. apicepunctella, *Wlsm.* .	...	...	...	...	...	...	...	*			

EXPLANATION OF PLATE XLI.

Fig. * 1. *Ptychamorbia exustana*, ♂ ♀, p. 497.
a, Neuration, ♀; *b*, neuration of fore wing, ♂; *c*, head, ♂; *d*, head, ♀; *e*, *f*, antenna, ♂.

* 2. *Ceratorrhineta calidana*, ♂ ♀, p. 499.
a, Neuration, ♂; *b*, neuration of fore wing, ♀; *c*, head, ♂; *d*, head, ♀; *e*, antenna, ♂.

3. *Episimus transferrana*, ♂, p. 501.
a, Neuration; *b*, head.

* 4. *Cacocharis albimacula*, ♀, p. 503.
a, Neuration; *b*, head.

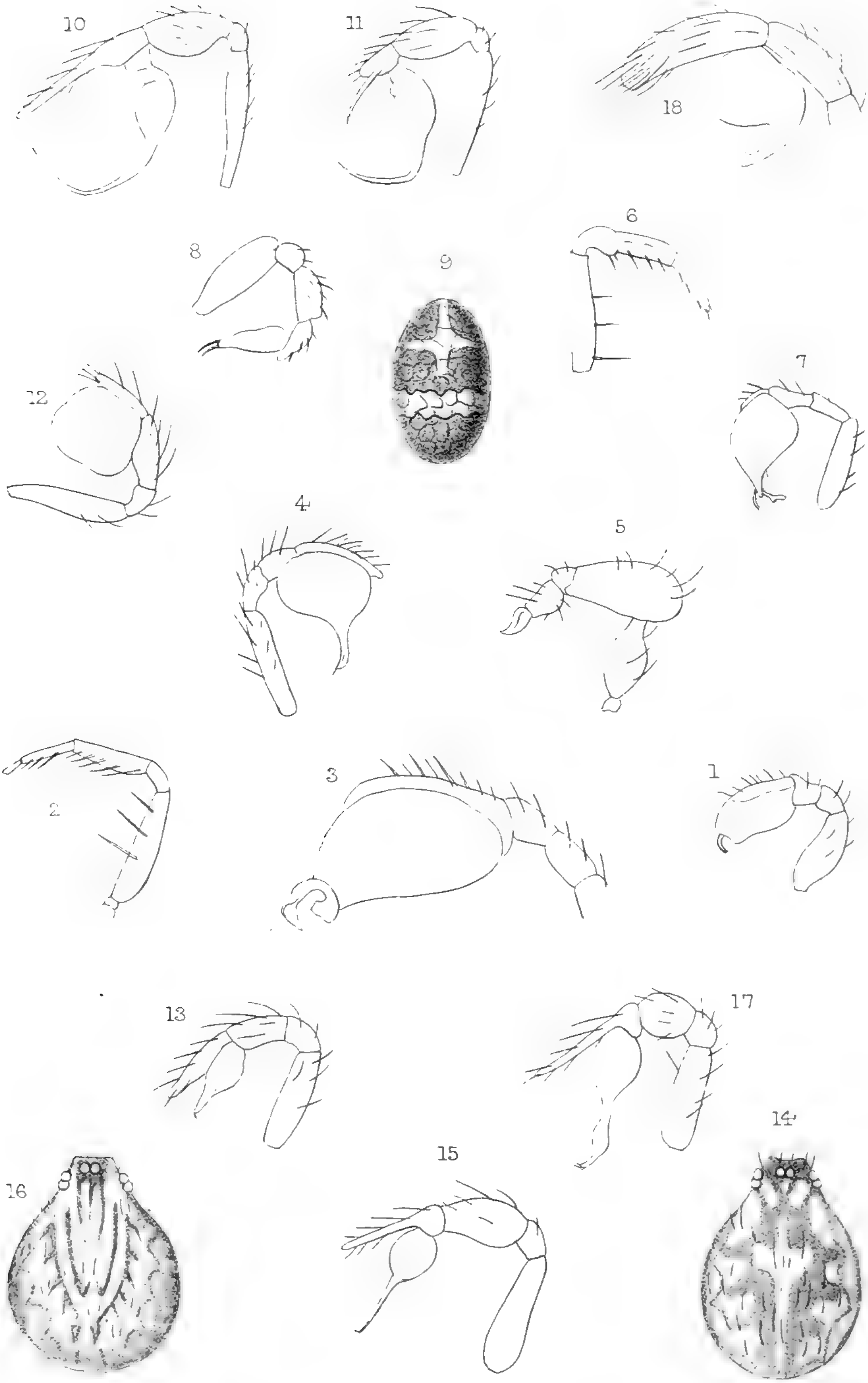
* 5. *Heligmocera calvifrons*, ♂, p. 507.
a, Neuration; *b*, *c*, head; *d*, antenna.

* 6. *Dendroneura præstans*, ♂ ♀, p. 509.
a, Neuration, ♂; *b*, head, ♂; *c*, head, ♀.

* 7. *Trapeziophora gemmula*, ♂, p. 530.
a, Neuration; *b*, head.

* 8. *Glyphidocera audax*, ♂, p. 531.
a, Neuration; *b*, head; *c*, antenna.

* 9. *Auximobasis persimilella*, ♂, p. 534.
a, Neuration; *b*, head; *c*, antenna.



A.T.H. sc.

West, Newman imp.

Spiders of St Vincent

Fig. * 10. *Eulepiste umbratipalpis*, ♂, p. 511. Genital segments.
11. *Acrolophus vitellus*, ♂, p. 512. Genital segments.
* 12. —— *poeyi*, ♂, p. 512. Genital segments.
13. —— *walsinghami*, ♂, p. 514. Genital segments.
* 14. *Anaphora noctuina*, ♂, p. 515. Genital segments.
* 15. *Felderia dimidiella*, ♂, p. 516. Genital segments.

* = Drawn from the type.
The figures are all enlarged.

3. On the Spiders of the Island of St. Vincent.—Part I. By E. Simon [1].

[Received October 16, 1891.]

(Plate XLII.)

[The Spiders dealt with in this memoir have all been obtained in the island of St. Vincent, British West Indies, by Mr. H. H. Smith, who was sent to the island by Mr. F. DuCane Godman, F.R.S., in order that he might assist the joint Committee appointed by the British Association and the Royal Society to report on and investigate the Natural History of the West-Indian Islands.

M. Eugène Simon has, at the request of the Committee, been so good as to undertake the examination and description of the Spiders [2], and in this paper he gives the result of his examination of the specimens belonging to the families Aviculariidæ, Filistatidæ, Uloboridæ, Dysderidæ, Oonopidæ, Leptonetidæ, Sicariidæ, Caponiidæ, Drassidæ, and Palpimanidæ.

As only a portion of the Order Araneæ is treated of in this first result of M. Simon's studies it would be premature to give statistics, but it is worth while to call attention to the facts that a great portion of the species—about 80 per cent.—are found to be new, and that a considerable number of the novelties are known to occur also in Venezuela, which country M. Simon himself recently visited, with the result of discovering a very large number of new Spiders and insects.—D. S.]

Ordo **ARANEÆ**, Sund.

Subordo ARANEÆ THERAPHOSÆ, Walck.

1. Familia Aviculariidæ.

1. Sectio *Aviculariidæ trionychæ*.

Subfamilia Paratropinæ.

Gen. Anisaspis, nov. gen.

Cephalothorax humilis, fovea carens. Oculi fere ut in Paratropi, *sed inter se magis appropinquati et subcontigui. Partes oris*

[1] Communicated by Dr. D. Sharp, F.R.S., F.Z.S., on behalf of the Committee for Investigating the Fauna and Flora of the West-Indian Islands.

[2] With the exception of those belonging to the family Attidæ, which will be worked out by Mr. Geo. W. Peckham, of Milwaukee.

pedesque fere ut in Paratropi, *sed parte labiali apice arcuata et minus dense spinulosa, pedum ungue inferiore vix ullo. Mamillæ duæ, articulo basali brevi et lato, articulo medio longiore et cylindrato, articulo ultimo medio multo breviore et obtuse conico.*

A *Paratropi*, E. Sim.[1], cui affinis est imprimis differt cephalothorace fovea carente, mamillis duabus tantum et articulo ultimo medio breviore.

1. Anisaspis tuberculata, sp. nov.

♀. *Long.* 4–6 *mm.—Cephalothorax breviter ovatus, humilis, sed longitudinaliter carinatus, rugosus et impressus, obscure fuscus, pilis pronis curvatis squamulisque ferrugineis crebre vestitus, in medio pilis albidis curvatis, antice uniseriatis postice biseriatis ornatus. Tuber oculorum parvum, elevatum et subrotundum. Oculi conferti. Abdomen breve, antice truncatum, postice leviter ampliatum et obtuse truncatum, fuscum, creberrime ferrugineo-squamulatum et tuberculis bacilliformibus obtusis et transversim ordinatis insigniter decoratum: ad marginem anticum tuberculis quatuor, mediis reliquis majoribus, dein tuberculis minoribus biseriatis sex* (2–2–2), *postice tuberculis similibus octo quadriseriatis* (4–4). *Mamillæ testaceæ. Sternum fulvum, tenuiter rugosum et setis longis clavatis munitum. Partes oris fulvæ et nitidæ. Pedes obscure fulvo-olivacei, fusco-variati, femoribus crassis, tuberculis parvis parum regulariter seriatis munitis, patellis tibiisque leviter angulosis, superne paululum depressis, tibiis cunctis supra aculeis binis:* 1° *gracili et arcuato, altero erecto et apice clavato, et subtus aculeis plurimis similibus armatis; metatarsis tarsisque cylindraceis sat gracilibus, et (saltem posticis) superne seta valida et erecta munitis.*

Insula Sancti Vincentii.

Subfamilia Ctenizinæ.

2. Pachylomerus salebrosus, sp. nov.

♀. *Long.* 16 *mm.—Cephalothorax normalis, lævis, nigro-piceus, parte cephalica postice leviter dilutiore. Oculi antici a sese anguste et fere æque separati, medii rotundi lateralibus plus* $\frac{1}{3}$ *minores, laterales late ovati et obliqui. Medii postici mediis anticis vix minores, leviter angulosi, a lateralibus posticis haud separati. Laterales postici mediis vix majores sed multo minores quam laterales antici. Spatium inter laterales anticos et posticos diametro oculi plus quadruplo angustius. Abdomen maximum, fusco-violaceo-sericeum, subtus dilutius, tuberculis minutissimis setiferis conspersum. Chelæ nigræ, prope apicem transversim rugatæ et rufulo-crinitæ, rastello ad angulum interiorem abrupte prominente. Partes oris, coxæ, sternumque obscure fulvo-rufescentia, nitida. Pars labialis ad apicem dentibus validis parum regulariter biseriatis* (5–3) *armata. Coxæ usque ad apicem*

[1] Typus *P. scrupens*, E. Sim., ex Amazona: *cf.* E. Simon, Ann. Soc. Ent. Fr. 1889, p. 214.

dentatæ, dentibus basilaribus reliquis validioribus. Pedes robustissimi, nigro-picei, femoribus inferne dilutioribus.

Insula Sancti Vincentii.

A *P. asperulo*, E. Sim., cui valde affinis est, imprimis differt oculis quatuor anticis inter se æquidistantibus, oculis lateralibus posticis mediis vix majoribus, rastello chelarum ad angulum abruptius prominente, parte labiali et præsertim coxis pedum maxillarium crebrius dentatis.

3. Phænothele[1] insularis, sp. nov.

♀. *Long.* 11 *mm.—Cephalothorax fusco-piceus, versus marginem posticum paulo dilutior, lævis et subglaber, elongatus, parte cephalica valde convexa, antice vix attenuata, utrinque sulco obliquo et abbreviato profunde impressa, parte thoracica depressa et postice valde attenuata, fovea valde procurva semilunari. Oculi antici, desuperne visi, lineam rectam designantes, medii lateralibus paulo minores. Oculi postici parvi, inter se subæquales. Abdomen breviter ovatum, supra nigricans et parum dense sericeo-pubescens, subtus testaceum. Mamillæ pallide testaceæ. Chelæ nigræ, validæ, rastello ex dentibus sat parvis sed numerosis et pluriseriatis composito. Sternum, partes oris pedesque fulva, femoribus, præsertim anticis, obscurioribus et olivaceis. Sternum læve, impressionibus parvis binis, transversim late remotis munitum. Pars labialis subquadrata, convexa et mutica. Pedes mediocres, tibia* 1^i *paris inferne, prope medium, aculeo setiformi munita, metatarso leviter scopulato, aculeo basilari aculeoque apicali minutissimis instructo, tibia* 2^i *paris aculeis setiformibus binis, metatarso aculeis inferioribus binis robustioribus aculeisque apicalibus binis instructo; patella* 3 *paris antice numerose et inordinate aculeata, sed patella* 4^i *paris mutica, tibia* 3^i *paris metatarsis* 3^i *et* 4^i *parium sat numerose aculeatis, tarsis posticis utrinque prope ungues minute biaculeatis.*

Insula Sancti Vincentii.

"S. end of island. Rocky ground, near the sea-level, under trailing plants."—*H. H. S.*

Subfamilia Diplurinæ.

4. Thelechoris guyanensis, Walck.

Mygale guyanensis, Walck. Apt. i. 1837, p. 231.

Entomothele guianensis, E. Sim. Ann. Soc. Ent. Fr. 1889, p. 216.

Insula Sancti Vincentii.

Tres commun dans toute l'île.

Espèce également répandue en Guyane et dans le nord du Brésil.

[1] Typus *P. gaujoni*, E. Sim., ex Ecuador: *cf.* E. Simon, Actes Soc. Linn. Bordeaux, 1889.

Nota.—Le genre *Entomothele*, E. Sim., est synonyme de *Thelechoris*, Karsch, qui a la priorité. D'après une communication du Dr. Lenz de Lubeck *Entomothele striatipes*, E. Sim., serait la même que *Thelechoris rutenbergi*, Karsch, la description et la figure, publiés par le Dr. Karsch, d'après un seul individu mutilé et en très mauvais état, sont tout-à-fait méconnaissables.

5. ACCOLA[1] MODESTA, sp. nov.

♀. *Long.* 8 *mm.*—*Cephalothorax angustus, testaceo-rufescens, lævis et nitidus, parce et longe cinereo-setosus. Oculi laterales utrinque juxte contigui, late ovati, anticus postico saltem* $\frac{1}{3}$ *major, laterales antici obliqui inter se anguste separati; oculi medii parvi, elongati, cum lateralibus posticis lineam parum recurvam formantes. Abdomen oblongum, testaceum, longe et sat remote albido-setosum. Sternum, chelæ pedesque testaceo-rufula, longe setosa, pedes quatuor antici fere mutici, postici, præsertim metatarsis et tibiis, aculeis gracilibus et longis numerosis instructi. Mamillæ lurido-testaceæ, articulo basali reliquis longiore, articulo apicali medio circiter æquilongo vel vix breviore.*

Insula Sancti Vincentii.

Ab *A. lucifuga*, E. Sim., differt oculis lateralibus anticis posticis evidentius majoribus et oculis quatuor posticis lineam minus recurvam designantibus.

Ab *A. cyclopi*, E. Sim., cui magis affinis est et subsimilis, differt imprimis oculis lateralibus anticis paulo minoribus distinctius separatis et mamillarum articulo ultimo multo breviore.

2. Sectio *Aviculariidæ dionychæ*.

Subfamilia BARYCHELINÆ.

6. STOTHIS[2] AFFINIS, sp. nov.

♀. *Long.* 10–13 *mm.*—*A* S. astuta, *E. Sim., cui valde affinis est, tantum differt spatio inter oculos laterales anticos et posticos diametro magno oculi saltem haud angustiore, pedibus anticis paulo gracilioribus, tibiis inferne aculeis setiformibus binis instructis, metatarsis aculeis binis robustioribus et longioribus, aculeis tibiarum et metatarsorum posticorum numerosioribus, parte labiali apice densius spinulosa.—Cephalothorax obscure fusco-piceus, fulvo-pubescens. Abdomen supra nigricans et fulvo-pubescens, maculis testaceis triseriatis ornatum, maculis mediis (quinque) subquadratis, lateralibus longioribus et obliquis; subtus testaceum et maculis quatuor obscurioribus, plus minus distinctis et laciniosis, notatum. Chelæ, sternum, pedes maxillares pedesque fusco-picea, patellis tarsisque paulo dilutioribus.*

Insula Sancti Vincentii.

"Glen near sea-level, under rubbish; 1000 ft., at roots of ferns."—*H. H. S.*

[1] Typus *A. lucifuga*, E. Sim., ex Venezuela: *cf.* Ann. Soc. Ent. Fr. 1889.

[2] Typus *S. cenobita*, E. Simon, ex Venezuela: *cf.* E. Simon, Ann. Soc. Ent. Fr. 1889.

Subfamilia Aviculariinæ.

7. Tapinauchenius sancti-vincentii.

Mygale sancti-vincenti, Walckenaer, Apt. i. 1837, p. 216.

♀. *Cephaloth. long.* 17·5 *mm., lat.* 15 *mm. Abd. long.* 20 *mm. Pedes*: I. 46·2 *mm.*, II. 41·5 *mm.*, III. 40 *mm.*, IV. 48·5 *mm.*—*Cephalothorax ovatus, humilis, nigricans, pilis tenuibus pronis sericeis leviter violaceo-micantibus, ad marginem longioribus, crebre tectus. Oculi quatuor antici, desuperne visi, lineam subrectam formantes; medii rotundi lateralibus paulo majores et inter se quam a lateralibus paulo remotiores; laterales elongati atque obliqui. Oculi postici utrinque appropinquati sed distincte separati, medii elongati et postice acuti, laterales latius ovati, mediis majores, sed lateralibus anticis minores, spatio inter laterales anticum et posticum dimidio diametro oculi plus duplo angustiore. Abdomen ovatum, supra nigricans, nigro-velutinum, longe et parcius cinereo-rufulo-hirsutum. Partes oris, sternum, coxæ venterque nigra et nigerrimo-velutina. Partes oris intus coccineo-ciliatæ. Pedes robusti, longissime et creberrime cinereo-sericeo-hirsuti. Scopulæ metatarsorum quatuor anticorum latissimæ et basin attingentes, scopulæ metatarsi* 3^{i} *paris tertiam partem basilarem occupantes, metatarsi* 4^{i} *paris apicem tantum occupantes. Metatarsus* 4^{i} *paris tibia circiter æquilongus. Mamillæ nigræ, nigro-velutinæ, metatarso* 4^{i} *paris non multo breviores, articulo ultimo medio longiore.*

Insula Sancti Vincentii.

Subordo ARANEÆ VERÆ, E. Sim.

1. Araneæ veræ cribellatæ.

1. Familia Filistatidæ.

8. Filistata capitata, Hentz.

Filistata capitata, Hentz, Bost. J. Nat. Hist. iv. 1842, p. 228, t. viii. f. 7.

Teratodes depressus, C. Koch, Ar. ix. 1842, p. 103, f. 755.

Filistata cubæcola, Lucas in Ramon de la Sagra, Hist. Cuba, &c., Ar. 1853, p. 74, tab. iv. f. 2.

Filistata capitata, Keyserl. Verh. z.-b. Ges. Wien, 1879, p. 345, tab. iv. f. 33.

Insula Sancti Vincentii.

"Windward side near Stuce River."—*H. H. S.*

Espèce très répandue dans toute l'Amérique tempérée et tropicale depuis le sud des Etats-Unis jusqu'à la République Argentine.

2. Familia Uloboridæ.

9. Dinopis spinosus, Marx.

Dinopis spinosus, Marx, Proceed. Acad. Nat. Sc. Philad. 1889, p. 341, tab. xi.

Insula Sancti Vincentii.

Cette espèce est répandue dans le sud des Etats-Unis (Florida, Alabama, &c.), dans les Antilles, et au Vénézuela.

10. Uloborus penicillatus, sp. nov.

♀. *Long.* 4 *mm.—Cephalothorax nigricans, linea media testacea, antice evanescente, notatus, pilis plumosis, supra albis versus marginem fulvis, crebre vestitus. Oculi postici sat magni, subæquales, in lineam validissime recurvam dispositi, medii inter se quam a lateralibus evidenter remotiores. Oculi antici, prope marginem clypei siti, medii lateralibus paulo majores. Area oculorum mediorum vix longior quam latior et antice quam postice non multo angustior. Abdomen in parte prima validissime tumidum, apice mucronibus binis grossis obtusis, leviter divaricatis et antice penicillatis munitum, postice longe declive attenuatum et subacuminatum, subtus in regione ventrali convexum, nigricans, fulvo ferrugineoque pubescens, in declivitate anteriore dilutiore et linea media fusca longitudinali notatum, in declivitate posteriore linea media fusca tenuiore et maculis albis parvis biseriatis notatum, utrinque in partibus lateralibus macula nigricanti subrotunda ornatum. Pedes valde inæquales: pedes* 1[i] *paris reliquis multo longiores, femore patella tibiaque crassiore, fusci, femore subtus dilutiore et intus prope medium subannulato, tibia ad basin dilutiore, ad apicem leviter incrassata et supra et subtus setis longis crassis nigris rufulisque cristam formantibus ornata, patella supra ad apicem setis similibus paucis munita, metatarso luteo, gracili et recto. Pedes sex posteriores obscure fulvi, plus minus fusco-variati, cuncti ferrugineo-pubescentes et pilis plumosis albis conspersi; tibia* 2[i] *paris supra ad apicem leviter cristata, metatarso* 4[i] *paris in dimidio basilari fulvo, depresso et calamistro munito, in dimidio apicali fusco et recto. Vulva processu depresso retro-directo apice bifido munita.*

♂. *Long.* 3·2 *mm.—Cephalothorax latius ovalis, postice et præsertim antice magis attenuatus, nigricans, linea media testacea integra sectus, pilis plumosis fulvis parce munitus. Abdomen anguste oblongum, nec elevatum nec mucronatum, ad marginem anticum minute incisum, nigricans, plus minus fulvo-testaceo variatum. Pedes longiores, tibiis* 1[i] *paris sat gracilibus longis et leviter arcuatis, haud cristatis sed superne usque ad basin aculeis fulvis pellucentibus numerosis et fere inordinatis insigniter munitis. Pedes-maxillares brevissimi, luridi, patella tibiaque nigris.*

Var. *β. Cephalothorax obscure fulvus, vittis duabus fuscis antice evanescentibus notatus, pilis plumosis in medio albis in lateribus coccineis vestitus. Abdomen pallide fulvum, fulvo-aurantiaco* *pubescens et parce albo-variatum. Pedes fulvi, antici vix infuscati, cristis tibialibus fulvis.*

Var. γ. *Nigrum, cephalothorace prope marginem posticum minute testaceo-lineato, pilis plumosis obscure fulvis vestito et pilis albis paucis lineam mediam lineamque marginatem designantibus ornato. Abdomine in declivitate posteriore punctis albis paucis biseriatis ornato. Metatarso* 1[i] *paris in parte basali luteo, pedum sex posterioribus femoribus prope apicem, tibiis ad basin, metatarsis ad basin, in medio atque ad apicem anguste testaceo-annulatis.*

Insula Sancti Vincentii.

Commun dans toute l'île.

11. Miagrammopes scoparius, sp. nov.

♀. *Long.* 6 *mm.—Cephalothorax ater, ad marginem clypei anguste testaceus, pilis plumosis pronis fulvo-nitidis dense vestitus, multo longior quam latior, antice posticeque truncatus, fere parallelus, sed antice ad oculos abrupte latior, pone oculos leviter transversim impressus. Oculi longe ante medium siti, æquales, medii inter se quam a lateralibus multo remotiores, sed spatio inter medios et laterales diametro oculi plus triplo latiore. Abdomen fulvum, supra albido-pubescens et vitta media obscuriore fulvo-pilosa, postice sensim ampliata et utrinque minute nigro-punctata, notatum, subtus albido-pilosum, minute nigro-quadripunctatum et utrinque, paulo ante medium, macula majore subrotunda nigra notatum, longissimum et subparallelum, antice recte sectum, postice supra mamillas brevissime productum et rotundum. Partes oris pedesque obscure fulvo-olivacea; pedes antici late nigricanti-variati, postici patellis metatarsisque supra infuscatis. Pedes antici reliquis multo longiores et robustiores, femoribus tibiisque validis et cylindraceis, tibiis inferne longius fulvo-pilosis, metatarsis cylindraceis leviter curvatis et versus apicem attenuatis et supra et extus pilis longis erectis nigris rufulisque mixtis cristam duplicem formantibus ornatis sed ad apicem brevius albo-pilosis; metatarso* 4[i] *paris tibia fere duplo breviore, paulo crassiore supra longe excavato et calamistro tertiam partem apicalem articuli attingente munito, subtus cum tarso spinis obtusis et leviter clavatis numerosis et regulariter seriatis munito.*

♂. *Long.* 4·5 *mm.—Cephalothorax brevior et antice latior, sed postice sensim attenuatus. Abdomen brevius, nigricans, fulvo-pilosum, vitta media parum expressa, confuse testaceo-marginata. Pedes antici haud cristati, rufuli supra nigricantes, tibiis supra aculeis validis acutis et leviter lanceolatis biseriatis* (12–8) *valde armatis, metatarsis aculeis debilioribus parcius munitis, metatarsis* 4[i] *paris nigris subteretibus et rectis. Pedes-maxillares brevissimi, fulvo-rufuli, femore crasso et brevi valde curvato, patella tibiaque circiter æquilongis, tibia ad apicem processu fulvo minuto et obtuso supra munita, tarso bulboque subglobosis.*

Insula Sancti Vincentii.

2. Araneæ veræ ecribellatæ.

1. Familia Dysderidæ.

12. **Ariadne solitaria**, sp. nov.

♀. *Long.* 8 *mm.—Cephalothorax ovatus, pallide fusco-piceus, subtilissime coriaceus, nitidus, parce setosus. Oculi sat magni et ovati, subæquales (laterales antici reliquis paulo majores), medii inter se juxta contigui, utrinque laterales contigui, spatium inter medios et laterales diametro oculi non multo latius. Clypeus oculis lateralibus anticis angustior. Abdomen oblongum, teretiusculum, supra atro-violaceum, subtus et in lateribus, præsertim antice, fulvo-testaceum, cinereo-pubescens. Chelæ breves et robustæ, fusco-piceæ, nitidæ, nec rugatæ nec rugosæ. Sternum pallide fusco-rufescens nitidum. Pedes sat breves, luridi, metatarsis tarsisque anticis infuscatis, pedes antici posticis longiores et robustiores, femore* 1^{i} *paris apice incrassato supra aculeis tribus, intus aculeis binis (inferiore altero multo longiore et leviter sinuoso) armato; patella mutica, tibia et intus et extus aculeis parvis tribus uniseriatis et subtus aculeis longioribus* 4–4 *armata, metatarso subtus aculeis similibus sed inæqualibus* 6–6 *instructo, sed aculeis lateralibus carente; tibia* 2^{i} *paris intus aculeis lateralibus parvis tribus extus aculeo minutissimo unico et subtus aculeis longis* 4–4 *armata, tibia* 3^{i} *paris aculeis binis uniseriatis, metatarso aculeis binis uniseriatis et apicalibus binis subtus munitis. Pedes* 4^{i} *paris omnino mutici. Pedes-maxillares breves et robusti, fulvi, tarso infuscato apice acuminato, tibia tarsoque intus sat numerose et fere inordinate aculeatis.*

Ab *A. pennsylvanica*, C. Koch (*bicolore*, Hentz), cui affinis est, differt oculis oblongis et minus disjunctis, femore antico apice pluriaculeato, tibiis anticis aculeis inferioribus et lateralibus armatis (in *A. pennsylvanica* femore uniaculeato et tibiis aculeis inferioribus tantum armatis).

Insula Sancti Vincentii.

"Baronallie, near sea-level, open valley; under rubbish."—*H. H. S.*

2. Familia Oonopidæ.

Gen. Dysderina, nov. gen.

Oonops, Keyserling (ad part.).

A Gamasomorpha, *Karsch, cui affinis est, differt oculis posticis inter se juxte contiguis et lineam rectam formantibus, mediis lateralibus majoribus, oculis anticis reliquis oculis majoribus et spatio diametro oculi evidentissime angustiore inter sese separatis, clypeo oculis anticis angustiore, sterno lato sed postice magis attenuato et truncatura postica coxis angustiore, scutis abdominalibus dorsali et præsertim ventrali postice plus minus abbreviatis et mamillas haud attingentibus, pedibus longioribus, coxis* *cunctis longioribus quam latioribus et cylindraceis, tibiis metatarsisque anticis et sæpe femoribus aculeis longis pronis biseriatis ordinatis subtus instructis.—Pedes-maxillares maris femore patella tibiaque gracilibus et teretibus, tarso bulboque maximis, ovatis, apophysi apicali parva instructis.*

Typus hujus generis est *Oonops principalis*, Keyserling.

13. Dysderina principalis, Keyserling. (Plate XLII. fig. 1.)

Oonops principalis, Keyserl. Verh. z.-b. Ges. Wien, 1881, p. 296.

♀. *Long.* 4 *mm.—Cephalothorax fusco-purpureus, subniger, coriaceo-rugosus, spatio medio et in lateribus zonis radiantibus latis et parum regularibus lævibus et nitidis notatus. Area oculorum compactilis, latitudinem frontem fere totam occupans. Oculi postici subæquales, desuperne visi, lineam subrectam designantes, medii inter se juxte contigui, a lateralibus vix separati. Oculi antici posticis paulo majores, subrotundi, spatio diametro oculi circiter duplo angustiore inter sese distantes. Clypeus leviter depressus et tenuiter marginatus, oculis anticis circiter æquilatus. Scuta abdominalia fusco-purpurea, lævia et nitidissima, dorsale magno tertiam partem apicalem abdominis superante, ventrale medium superante, tenuissime marginato, postice recte secto, antice in pediculo transversim carinulato. Sternum rufulum, ad marginem grosse et parce granosum et in medio carinulis nigris flexuosis areolato-cancellatum. Pedes obscure fulvo-rufuli, mediocres, femoribus sat robustis et compressis, anticis extus aculeis seriatis tribus et intus, in parte apicali, aculeis binis instructis, tibiis inferne leviter deplanatis et aculeis longis et pronis, biseriatis* 4–5, *metatarsis aculeis similibus* 2–2 *armatis.*

♂. *Long.* 3·5 *mm.—Femina subsimilis, sed scutis abdominalibus majoribus in dorso fere omnino obtectis. Pedes-maxillares lutei, femore sat crasso, arcuato et clavato, tibia patella paulo longiore, teretiusculo, bulbo magno, ovato.*

Insula Sancti Vincentii.

Cette espèce, décrite de Colombia par Keyserling, se trouve aussi au Vénézuela, où elle est commune.

14. Dysderina princeps, sp. nov.

♀. *Long.* 4 *mm.—Cephalothorax nigro-purpureus, uniformiter valde et crebe coriaceo-granulosus. Area oculorum compactilis et latitudinem frontem fere totam occupans. Oculi postici subæquales, contigui, in lineam rectam dispositi. Oculi antici posticis paulo majores, subrotundi, spatio diametro oculi fere duplo angustiore inter sese separati. Clypeus oculis anticis circiter æquilatus, leviter depressus et tenuiter marginatus. Scuta abdominalia nigro-purpurea, parce et crasse albido-pilosa, dorsale opaco, magno, tertiam partem apicalem superante, ventrale nitido, dimidium ventrem multo superante, haud marginato et postice recte secto, antice in pediculo tenuiter transversim striolato. Sternum fusco-purpureum, ad marginem parce et grosse granosum, in* *medio carinis flexuosis parum distincte areolatum. Pedes fulvo-rufuli ut in præcedente aculeati.*

A *Dysderina principali*, Keyserl., cui valde affinis est, præsertim differt cephalothorace uniformiter granoso et scuto abdominali superiore opaco.

Insula Sancti Vincentii.

15. DYSDERINA SPINIGERA, sp. nov. (Plate XLII. figs. 2, 3.)

♀. *Long.* 4·5 *mm.—Cephalothorax pallide rufescens, versus marginem leviter infuscatus, crebre coriaceo-rugosus, latus et convexus. Area oculorum compactilis, latitudinem frontalem paulo angustior. Oculi sat magni, subæquales, ovati et inter se juxte contigui, quatuor postici in lineam plane rectam, duo antici (reliquis paulo majores), spatio diametro oculi angustiore sejuncti. Clypeus oculis anticis circiter æquilatus. Scuta abdominalia fulvo-aurantiaca, lævia et nitida, dorsale ovatum, dimidiam longitudinem non multo superans, ventrale rimam epigastricam non multo superans et postice late rotundum, antice, prope petiolum, transversim striatum. Sternum rufulum, tenuiter et crebre coriaceo-rugosum, et granulis paulo majoribus conspersum. Pedes robusti et parum longi, luridi, femore* 1[i] *paris subtus, ad marginem exteriorem, aculeis tribus* (1 *et* 2 *longissimis), ad marginem interiorem, in parte apicali aculeis tribus paulo minoribus armato; femore* 2[i] *paris utrinque aculeis multo minoribus binis armato, tibiis anticis subtus paululum depressis et aculeis longissimis pronis et leviter elevatis* 5–5 *et metatarsis aculeis similibus* 3–3 *valde instructis.*

♂. *Long.* 4 *mm.—Feminæ fere similis, sed scutis abdominalibus dorsali et ventrali fulvo-rufulis, multo majoribus, apicem fere attingentibus et postice subtruncatis, sterno convexiore, coriaceo sed antice, pone partem labialem, lævi et nitido, pedum anticorum aculeis debilioribus. Pedes-maxillares lutei, femore sat gracili, patella et tibia circiter æquilongis et leviter ovatis, tarso bulboque maximis, albidis et subpellucentibus, reliquis articulis simul sumptis multo longioribus et crassioribus, bulbo late ovato sed sensim attenuato atque apophysi sat robusta, rufula apice nigra, contorta apice oblique secta et acuta instructo.*

Insula Sancti Vincentii.

Se trouve aussi au Vénézuela, où il est très répandu.

Gen. CINETOMORPHA, nov. gen.

Cephalothorax breviter ovatus et, præsertim postice, convexus. Area oculorum latitudinem frontalem totam occupans. Oculi quatuor postici in lineam valde procurvam, medii inter se juxte contigui et lateralibus majores, laterales a mediis distincte separati. Oculi antici reliquis paulo majores et spatio diametro oculi latiore inter se distantes. Clypeus oculis anticis latior, rarius æquilatus. Abdomen subglobosum vel breviter ovatum, scuto dorsali magno omnino obtectum, scuto ventrali magno, sed *mamillas haud attingente et postice subrecte secto; mamillæ inferne semicirculo coriaceo cinctæ. Sternum latum, sed paulo longius quam latum, postice attenuatum et inter coxas posticas recte sectum. Pedes breves et robusti, omnino mutici, coxis cunctis subglobosis, femoribus, præsertim anticis, compressis et subclavatis, tarsis minutis metatarsis brevioribus. Pedes-maxillares maris femore robusto et subclavato, tibia patellaque brevibus et subæquis, bulbo mediocri sed apophysem apicalem longissimam et intus curvatam gerente.*

Typus hujus generis est *C. puberula*, E. Sim.

16. Cinetomorpha simplex, sp. nov.

♀. *Long.* 3 *mm.—Cephalothorax fulvo-aurantiacus, breviter ovatus et convexus, antice antennatus et obtusus, omnino crebre et subtiliter coriaceo-granulosus et in medio setis nigris paucis erectis munitus. Abdomen magnum, scuto dorsali rufulo, uniformiter subtiliterque coriaceo, minute et parcissime impresso, et pilis luteis sat longis et crassis parce vestito, scuto ventrali sublævi antice in regione epigasteris leviter ruguloso. Sternum omnino subtiliter coriaceo-rugosum. Pedes breves, fulvo-aurantiaci.*

Insula Sancti Vincentii.

A *C. silvestri*, E. Sim., cui valde affinis est, imprimis differt pilis abdominis crassis et luteis.

Gen. Pelicinus, nov. gen.

Cephalothorax sternumque fere ut in Gamasomorpha, *sed cephalothorace humiliore. Area oculorum latitudinem frontalem fere totam occupans. Oculi cuncti æquales, quatuor postici in lineam valde procurvam ordinati, medii inter se juxte contigui, sed a lateralibus distincte separati. Oculi antici spatio diametro oculi latiore inter se distantes. Clypeus oculis anticis latior. Abdomen anguste oblongum, scuto dorsali omnino obtectum, scuto ventrali abbreviato dimidium ventrem vix superante. Mamillæ haud coriaceo-cinctæ. Pedes sat longi, coxis cunctis subglobosis, femoribus ad basin compressis, metatarsis tarsisque longis et gracillimis. Pedes-maxillares maris femore gracili, patella tibiaque circiter æquilongis et teretiusculis, bulbo magno, globoso et depressiusculo, apophysi media sat longa instructo.*

17. Pelicinus marmoratus, sp. nov. (Plate XLII. fig. 4.)

♀. *Long.* 3 *mm.—Cephalothorax flavo-rufescens, subtiliter et crebre coriaceus et in medio pilis albidis crassis paucis munitus, area oculorum nigro-cincta. Oculi æquales, postici in lineam valde procurvam dispositi, antici ovati atque obliqui. Sternum luteum, subtiliter coriaceum et opacum. Abdomen sat anguste ovatum, scuto dorsali nitido sed subtilissime coriaceo et pilis albidis crassis et longis consperso, obscure fulvo-livido, maculis magnis infuscatis parum expressis et subquadratis quadriseriatim ordinatis ornato; scuto ventrali rufulo, leviter coriaceo et piloso, abbreviato, postice* *paululum attenuato-truncato et dimidium ventrem non multo superante. Pedes omnino luridi, crasse cinereo-pilosi, metatarsis tarsisque, præsertim posticis, gracillimis et longis.*

♂. *Long.* 3 *mm.—Feminæ similis. Pedes-maxillares lutei, femore gracili sat longo, patella tibiaque circiter æquilongis et cylindraceis, bulbo maximo globoso et depressiusculo, apophysi media sat longa et leviter curvata munito.*

Insula Sancti Vincentii.

Gen. Opopæa, nov. gen.

Cephalothorax longus, oblongus et humilis, supra rectus et deplanatus, postice abrupte declivis et truncatus. Area oculorum latitudinem frontalem fere totam occupans. Oculi quatuor postici, desuperne visi, juxte contigui et lineam leviter recurvam formantes, medii lateralibus majores. Oculi antici reliquis majores, inter se angustissime separati. Clypeus oculis anticis multo angustior. Sternum magnum, longe ovatum, postice obtusum. Abdomen scutis dorsali et ventrali omnino obtectum. Pedes breves et robusti, mutici, coxis globosis, femoribus compressis et late clavatis, tarsis anticis metatarsis non multo brevioribus. Pedes-maxillares maris insignes, femore parvo et clavato, patella maxima late ovata, tibia minutissima nodiformi, tarso sat longo teretiusculo, bulbo parvo dentiformi ad apicem tarsi inserto.

18. Opopæa deserticola, sp. nov. (Plate XLII. fig. 5.)

♀. *Long.* 2·7 *mm.—Cephalothorax fulvo-rufescens, in medio late dilutior, lævis et pilis albidis crassis paucis ornatus, in lateribus subtilissime et crebre striolatus, area oculorum anguste nigro-cincta. Oculi postici contigui, medii lateralibus paulo majores. Oculi antici reliquis majores, spatio diametro oculi plus duplo angustiore inter sese sejuncti. Sternum fulvum, læve, nitidissimum. Scuta abdominalia fulvo-aurantia, nitida, sed minute et parcissime rugosa et pilis albis sat longis conspersa. Pedes-maxillares pedesque omnino lutei.*

♂. *Long.* 2·5 *mm.—Feminæ subsimilis. Pedes-maxillares lutei, femore parvo, compresso et minute clavato, patella maxima, late ovata, ad basin valde et retro convexa, tibia minutissima, nodiformi, tarso tibia longiore cylindraceo, bulbo ad apicem tarsi inserto, brevi obtuso, leviter curvato et dentiformi.*

Insula Sancti Vincentii.

O. deserticola, E. Sim., habite presque toutes les régions chaudes et désertiques du globe ; je l'ai trouvée dans le Sahara Algérien, en Egypte, en Arabie, aux Iles Philippines et au Vénézuela.

Une espèce très voisine, du Pérou, a été décrite par Keyserling sous le nom d'*Oonops cupidus* (Verh. z.-b. Ges. Wien, 1881, p. 298, t. xi. f. 19), mais la figure que Keyserling a donnée de la patte-mâchoire du mâle indique des différences ; c'est ainsi que l'article du tarse paraît beaucoup plus long et le bulbe au contraire plus petit et terminé en pointe fine contournée.

Gen. TRIÆRIS, nov. gen.

Cephalothorax breviter ovatus, postice sat convexus et fere abrupte declivis. Oculi postici contigui in lineam leviter recurvam ordinati, medii lateralibus paulo majores. Oculi antici spatio diametro oculi latiore inter se distantes. Clypeus oculis anticis paulo latior. Sternum late cordiforme, postice attenuatum, sed inter coxas posticas late truncatum. Abdomen longum, scuto inferiore brevi, rimam epigasterem haud superante, scuto dorsali abdomine angustiore, longe ovato, medium dorsum non multo superante. Pedes sat breves et robusti, patellis tibiis metatarsisque 1ⁱ paris inferne setis rigidis spiniformibus biseriatis instructis, patellis 1ⁱ paris reliquis patellis multo longioribus et tibiis non multo brevioribus.

19. TRIÆRIS STENASPIS, sp. nov.

♀. *Long.* 2·5 *mm.—Fulvo-aurantius, nitidus, sterno coxis tarsisque dilutioribus, oculis anguste nigro-cinctis, abdomine, plagula dorsali excepta, albo-testaceo. Cephalothorax ovatus, postice convexus, lævissimus. Area oculorum fronte paulo angustiore. Abdomen supra plagula aurantiaca nitida anguste ovata et antice sensim angustiore, medium superante notatum, subtus regione epigasteris fulva, leviter coriacea, et, pone aperturam genitalem, minute fusco-notata. Sternum læve et nitidum. Pedes parum longi, femoribus late clavatis, patellis 1ⁱ paris insigniter longis subtus setis rigidis spiniformibus binis armatis, tibia 1ⁱ paris subtus setis similibus biseriatis munita. Pedes-maxillares graciles et parce setosi.*

Insula Sancti Vincentii.

Se trouve aussi au Vénézuela (Caracas, San Esteban).

Gen. SCAPHIELLA, nov. gen.

Cephalothorax oblongus, fere ut in Opopæa, *sed postice leviter acuminatus et valde declivis. Oculi postici contigui, in lineam leviter procurvam, rarius rectam dispositi, æqui vel sæpius medii paulo majores; oculi antici reliquis majores, inter se juxte contigui, rarius anguste separati. Clypeus oculis anticis latior et leviter porrectus. Sternum late cordiforme, convexum, postice attenuatum, sed inter coxas posticas sat late truncatum. Pedes breves et robusti, omnino mutici, coxæ cunctæ subglobosæ.—♀. Abdomen longe cylindraceum, scuto dorsali carens, scuto ventrali maximo, mamillas attingente, postice truncato et leviter emarginato, utrinque valde ampliato et partes laterales omnino amplectente, munitum. Pedes-maxillares breves et robusti, femore clavato, tarso dilatato et ovato, sed apice acuminato, intus ad basin fasciculo setarum munito.—♂. Abdomen longe ovatum, depressiusculum, scuto ventrali scutoque dorsali fere omnino obtectum.*

20. SCAPHIELLA CYMBALLARIA, sp. nov.

♀. *Long.* 2·5 *mm.—Cephalothorax ovatus, læte fulvo-rufescens,* *versus marginem sensim infuscatus, in medio lævis et nitidissimus, in lateribus et postice, in declivitate, crebre coriaceo-granulosus. Oculi postici contigui, desuperne visi, in lineam leviter procurvam ordinati, medii lateralibus paulo majores. Oculi antici reliquis multo majores et inter se subcontigui. Sternum scutumque abdominale rufescentia, lævia et nitidissima, marginibus scuti haud coalescentibus, et abdomen supra livido-membranaceum. Pedes flavo-aurantii, parce pilosi, sat longi, femoribus compressis et clavatis, metatarsis anticis tarsis multo longioribus. Pedes-maxillares breves et robusti, femore lato, subclaviformi, tibia patella æquilonga, tarso ampliato, ovato sed acuminato, intus ad basin setis robustis nigris fasciculum formantibus munito.*

♂. *Long.* 2·2 *mm.—Cephalothorax scutisque ut in femina. Abdomen anguste oblongum, scuto dorsali fulvo-nitido parce et longe albo-piloso, scutoque ventrali etiam fulvo-nitido, mamillas haud attingente, sed medio superante, fere omnino obtectum. Chelæ ad basin leviter prominentes et acuminatæ. Pedes-maxillares femore robusto et subclaviformi, patella tibiaque brevibus et subæquis, bulbo maximo, late ovato, stylo libero tenui et sat longo instructo.*

Insula Sancti Vincentii.
Se trouve aussi au Vénézuela.

Gen. Ischnaspis, nov. gen.

Cephalothorax breviter ovatus, modice convexus. Area oculorum latitudinem frontalem totam occupans. Oculi sat magni, quatuor postici inter se juxte contigui et lineam leviter procurvam formantes. Oculi duo antici reliquis paulo majores et inter se contigui. Clypeus oculis anticis angustior. Sternum late cordiforme, sed postice attenuatum et apice obtusum. Abdomen ovatum, subtus haud scutatum, supra, in parte basali, scuto angusto et ovato munitum. Pedes longi, coxis cunctis paulo longioribus quam latæ, femoribus compressis et robustis, tibiis metatarsisque quatuor anticis subtus valde biseriatim aculeatis.—

♂. *Cephalothorax gibbosus, partes oris valde singulares, laminæ apice acuminatæ, pars labialis quadrata. Pedes-maxillares semper nigri, minuti et valde curvati, articulis cunctis subæqualibus.*

21. Ischnaspis peltifer, sp. nov.

♀. *Long.* 3·5 *mm.—Cephalothorax fulvo-olivaceus vel rufescens, versus marginem leviter infuscatus, lævis et nitidus, area oculorum anguste nigro-cincta. Abdomen ovatum, album, supra in parte basali scuto fusco-olivaceo nitido anguste parallelo et apice rotundo, medium dorsum superante munitum. Chelæ leviter infuscatæ. Sternum fulvo-nitidum. Pedes omnino luridi, femoribus anticis intus, in parte apicali, aculeis longis binis armatis, tibiis inferne aculeis longissimis et pronis* 4–3, *metatarsis aculeis similibus* 2–2 *instructis. Pedum-maxillarium tibia* *patella longior, tarsus gracillimus, leviter curvatus, tibia et patella simul sumptis longior.*

Insula Sancti Vincentii.

Espèce dont l'habitat est très étendu, car nous l'avons reçue de Sierra Leone dans l'Afrique occidentale et nous l'avons trouvée aux Iles philippines, où le genre est en outre représenté par une seconde espèce.

22. OONOPS SPINIMANUS, sp. nov. (Plate XLII. fig. 6.)

♀. *Long. 3 mm.—Pallide luridus, subpellucens, lævis et nitidus, oculis anguste nigro-cinctis, abdomine supra leviter obscuriore et livido, subtus, prope mamillas, utrinque minute fusco-notato. Cephalothorax breviter ovatus, postice altus et sat abrupte declivis, antice sensim et leviter declivis, fronte angusta. Area oculorum latitudinem frontalem fere totam occupans. Oculi subæquales (laterales antici reliquis vix majores), medii inter se juxte contigui et intus subrecti, laterales subrotundi, antici spatio diametro oculi paulo angustiore inter sese distantes. Pedes-maxillares femore subtus setis rigidis tribus uniseriatis, patella intus, ad apicem, leviter dilatata et setis spiniformibus longis et erectis binis armata, tibia leviter curvata, intus setis similibus uniseriatis 3 vel 4 (basilari reliquis longiore) et subtus et supra setis minoribus instructa, tarso fere similiter setoso. Tibia metatarsoque 1i paris setis spiniformibus pronis seriatis subtus munitis.*

Insula Sancti Vincentii.

Se trouve aussi au Vénézuela.

23. OONOPS GLOBIMANUS, sp. nov. (Plate XLII. fig. 7.)

♀. *Long. 2·3 mm.—Pallide luridus, subpellucens, oculis angustissime nigro-cinctis, abdomine albo-testaceo. Cephalothorax breviter ovatus, postice altus et sat abrupte declivis, fronte angusta. Area oculorum latitudinem frontalem fere totam occupans. Oculi ut in* O. spinimano, *E. Sim., ordinati. Pedes-maxillares graciles, tibia metatarsoque, præsertim intus, setis rigidis, sat numerosis et fere inordinatis munitis. Pedes sat longi, tibiis metatarsisque anticis subtus setis rigidis biseriatis munitis, tibiis metatarsisque posticis parce aculeatis.*

♂. *Long. 2·3 mm.—Feminæ similis, sed pedibus paulo longioribus. Pedes maxillares lutei, bulbo albo processibus apicalibus parvis fuscis; femore gracili subrecto; patella tibiaque circiter æquilongis, tibia leviter depressa; bulbo maximo, reliquis articulis cunctis longiore et plus triplo crassiore, ad basin, præsertim postice, valde convexo, ad apicem valde attenuato et apophysibus duabus sat parvis munito, apophysi 1a setiformi et curvata, 2a apice malleiformi.*

Ab *O. pulchro,* Templ., cui affinis est, præsertim differt aculeis seriatis tibiarum anticarum minus distinctis, pedibus posticis evidenter aculeatis, bulbo maris majore, etc.

Insula Sancti Vincentii.

Se trouve aussi au Vénézuela.

24. Oonops pulicarius, sp. nov. (Plate XLII. fig. 8.)

♀. *Long.* 2·3 *mm.—Lurido-rufescens, oculis angustissime nigro-cinctis, abdomine albo-testaceo. Cephalothorax breviter ovatus, postice altus et abrupte declivis, fronte angusta et recte truncata. Area oculorum latitudinem frontalem totam occupans. Oculi magni, subæquales (laterales postici reliquis paulo minores), medii inter se juxte contigui, ovati et intus recti, laterales subrotundi, oculi antici spatio diametro oculi latiore inter sese distantes. Pedes-maxillares graciles, inordinate pilosi. Tibiæ quatuor anticæ inferne leviter deplanatæ et aculeis biseriatis* 5–5, *longissimis, pronis, fulvis et subpellucentibus, sed ad basin minute et singulariter fusco-tuberculatis, armatæ, metatarsi aculeis similibus* 3–3 *muniti. Pedes postici parce et tenuiter aculeati.*

♂. *Long.* 2·2 *mm.—Feminæ subsimilis, sed oculis anticis inter sese minus disjunctis, pedibus longioribus, anticis vix distincte aculeatis. Pedes-maxillares fulvo-castanei, sat breves, femore crasso, supra, præsertim ad apicem, convexo, patella parva et nodosa, tibia patella longiore et crassiore, cylindracea ad basin atque ad apicem brevissime et abrupte constricta, tarso tibia minore breviter acuminato, bulbo longo sed angusto, apice spinis duabus nigris parallelis et subæquis munito.*

Insula Sancti Vincentii.
Se trouve aussi au Vénézuela.

25. Oonops figuratus, sp. nov. (Plate XLII. fig. 9.)

♀. *Long.* 2·5 *mm.—Cephalothorax nitidissimus, fulvo-rufescens, versus marginem sensim infuscatus, oculis anguste nigro-cinctis. Abdomen supra atrum, leviter micanti-tinctum et lineolis nigris laxe clathratum, antice macula subcruciata, prope medium vitta transversa lata valde dentata et inæquali, albidis, ornatum, subtus albo-testaceum. Partes oris, sternum pedesque luteo-rufescentia, nitida. Oculorum area sat transversa, latitudinem frontalem fere totam occupans. Oculi medii rotundi, inter se juxte contigui, laterales a mediis distincte separati, anticus postico paulo major, spatium inter laterales anticos diametro oculi evidenter latius. Pedes-maxillares breves, femore sat robusto, tibia metatarsoque pilis rigidis sat brevibus et numerosis supra munitis. Pedes omnino mutici parce pilosi.*

Insula Sancti Vincentii.
Se trouve aussi au Vénézuela.

Gen. Stenoonops, nov. gen.

Ab Oonopi *differt cephalothorace longius ovali, humiliore et supra deplanato, sterno longiore postice minus attenuato et latius obtuso, coxis posticis subglobosis, latius separatis, area oculorum parva, dimidium latitudinis frontis vix occupante, oculis posticis parvis et contiguis in lineam plane rectam ordinatis, oculis anticis reliquis paulo majoribus et spatio diametro oculi saltem haud* *latiore inter se distantibus, clypeo angustissimo vix ullo, pedibus anticis patellis insigniter longis tibiis non multo brevioribus.*

26. **Stenoonops scabriculus**, sp. nov.

♂. *Long.* 2 *mm.—Cephalothorax rufulo-castaneus, ad marginem infuscatus, longus et humilis, crebre et uniformiter coriaceo-granulosus et pilis pronis albidis conspersus. Area oculorum mediocris, fronte angustior. Oculi antici reliquis majores, subrotundi et inter se angustissime separati, subcontigui. Abdomen cylindraceum, albo-testaceum, pilis crassis brevibus, albo-nitidis conspersum. Sternum obscure fulvo-rufulum, tenuiter coriaceo-granulosum. Pedes breves, robustissimi, obscure fulvo-rufuli. Pedes-maxillares fulvi, crasse cinereo-setosi; femore sat gracili et brevi, patella tibiaque brevibus et circiter æquilongis, tarso bulboque ovatis, ad apicem oblique truncatis, apophysi apicali parva, fulva, arcuata et obtusa munitis.*

Insula Sancti Vincentii.

Se trouve aussi au Vénézuela.

3. Familia Leptonetidæ.

Le groupe des *Leptonetides* se place entre les *Oonopides* et les *Sicariides,* auxquels il ressemble par la structure de ses organes sexuels et celle de ses griffes tarsales portées par un onychium.

Il s'éloigne des *Oonopides* par l'absence de la seconde paire de stigmates epigastriques et par ses filières inférieures séparées par un long *conulus.*

Il diffère des *Sicariides* par ses chilicères longues à marge supérieure dentée et à crochet long, par sa pièce labiale libre, par ses lames maxillaires peu inclinées et jamais conniventes.

Les *Leptonetides* sont des araignées lucifuges, dont les yeux disparaissent quelquefois (*Telema*? Sim.); quand ils existent ils sont au nombre de six. Les yeux forment tantôt un groupe compact transverse analogue à celui des *Orchestina* (*Ochyrocera, Psiloderces, Theoclia*), tantôt ils sont répartis en deux groupes, le premier formé de quatre yeux et le second de deux (*Leptoneta*).

Gen. Ochyrocera, nov. gen.

Cephalothorax non multo longior quam latus, utrinque ample rotundus, clypeo porrecto, lato, dimidium longitudinem cephalothoracis circiter æquante. Oculi quatuor antici in lineam plane rectam ordinati, laterales a mediis angustissime separati, utrinque laterales contigui et angulum acutum formantes. Pars labialis apicem versus leviter attenuata. Pedes longi, femoribus ad basin sensim incrassatis et longe fusiformibus, reliquis articulis gracillimis et flexuosis.—♂. *Pedes-maxillares valde singulares, femore gracili et longo, patella minuta nodiformi, tibia longa, incrassata, atque ovata, tarso apice gracillimo, longissimo et recto, bulbo anguste ovato, spina longissima et arcuata prædito.*

27. OCHYROCERA ARIETINA, sp. nov. (Plate XLII. fig. 10.)

♀. *Long.* 3·5 *mm.—Cephalothorax luridus, vitta media lata integra, in parte thoracica minute dentata, et utrinque vitta marginali latissima nigricantibus notatus, clypeo leviter infuscato, et sub oculis minute trilineato. Oculi medii subrotundi, inter se juxte contigui, utrinque oculi laterales bini, mediis paulo minores, elongati et inter se oblique contigui, sed a mediis anguste separati. Clypeus area oculorum plus triplo latior, valde proclivis, ad marginem late rotundus et leviter convexus. Abdomen sat anguste ovatum, convexum et postice acuminatum, nigricanti-lividum, plica epigasteris lata et minute ciliata, remota, prope medium ventrem sita. Sternum et partes oris nigricanti-livida, lævia. Pedes livido-violacei, tibiis metatarsisque ad apicem minutissime testaceo-notatis, longissimis fere ut in* Pholco, *femoribus versus basin valde incrassatis et longe fusiformibus, reliquis articulis gracillimis, metatarsis tarsisque filiformibus et flexuosis.*

♂. *Long.* 3 *mm.—Feminæ similis. Pedes-maxillares fusco-lividi; femore longo, gracili, versus basin leviter attenuato et arcuato; patella minutissima nodiformi, tibia patella plus triplo longiore, latiore et longe ovata; tarso ad basin sat lato et ovato, ad apicem gracillimo, recto, et longissimo; bulbo breviter pediculato, sat anguste ovato et versus apicem sensim attenuato, spina terminali longissima apice acuta valde curvata et semicirculum formante insigniter instructo.*

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28. OCHYROCERA QUINQUEVITTATA, sp. nov. (Plate XLII. fig. 11.)

♀. *Long.* 2·5 *mm.—Cephalothorax testaceo-virescens, area oculorum nigra, postice lineas tres abbreviatas emittente, parte cephalica postice maculis sat magnis nigris et obliquis litteram* **V** *designantibus, parte thoracica lineis radiantibus nigris, ad marginem ampliatis et coalitis ornatis, clypeo infuscato. Oculi ut in præcedenti, sed paulo majores. Clypeus angustior et minus porrectus, area oculorum vix duplo latior, ad marginem anticum, in medio, leviter excisus. Abdomen sat late ovatum, convexum et postice acuminatum, virescens, vittis transversis nigris quinque latis et arcuatis ornatum. Mamillæ nigræ. Sternum et partes oris fusco-virescentia, lævia. Sternum latissime cordiforme. Pedes longi (sed breviores quam in præcedenti), femoribus ad basin incrassatis, reliquis articulis filiformibus, testaceo-virescentes, femoribus, patellis, tibiis metatarsisque ad apicem minute nigricanti-annulatis in medio late et confuse infuscatis.*

♂. *Long.* 2 *mm.—Feminæ similis. Pedes-maxillares testaceo-virescentes, fere ut in præcedenti, tarso multo breviore et obtuso, sed prope apicem extus spinam longam et rectam emittente, spina bulbi longissima curvato-angulosa.*

Insula Sancti Vincentii.

Gen. Theoclia, nov. gen.

Ab Ochyrocera, *cui affinis est, differt clypeo angustiore et obliquo, area oculorum multo minore, latitudine frontali multo angustiore, oculis parvis, quatuor anticis inter se juxte contiguis et lineam rectam formantibus, oculis lateralibus posticis pone anticos oblique sitis, pedibus brevioribus, posticis anticis evidenter longioribus, femoribus haud insigniter incrassatis, partibus oris brevioribus.*

29. Theoclia radiata, sp. nov. (Plate XLII. fig. 12.)

♀. *Long.* 1·8 *mm.—Cephalothorax breviter ovatus, parum convexus, fulvo-olivaceus, fronte dilutiore et lutea, parte cephalica lineis tribus, media exili, lateralibus triangulariter dilatatis, maculaque postica transversim triquetra, parte thoracica linea marginali exili lineisque radiantibus numerosis et abbreviatis nigricantibus, notatis. Area oculorum parva et transversa, latitudine frontali minor. Oculi conferti, medii minutissimi, laterales paulo majores inter se æqui et obliqui, spatium inter anticos diametro oculi circiter duplo latius. Clypeus area oculorum haud latior, leviter porrectus. Abdomen globosum, fusco-testaceum. Partes oris, sternum pedesque fulvo-olivacea. Pedes longi, omnino mutici. Pedes-maxillares graciles, fulvi, apice nigri.*

♂. *Feminæ similis. Pedes-maxillares lutei, sat longi; femore longo, gracili, versus basin angustiore; patella parva; tibia patella fere duplo longiore, leviter ovata; tarso angusto, cylindraceo, tibia circiter æquilongo; bulbo maximo subgloboso.*

Insula Sancti Vincentii.

Se trouve aussi au Vénézuela.

4. Familia Sicariidæ.

30. Scytodes longipes, Lucas. (Plate XLII. fig. 13.)

Scytodes longipes, Lucas, Ann. Soc. ent. France, 1845, p. 71, tab. i. f. 2.

Scytodes marmorata, Taczanowski, Hor. Soc. ent. Ross. x. 1873, p. 107.

Scytodes longipes, Keyserling, Verh. z.-b. G. Wien, 1877, p. 210, t. vii. f. 3.

Scytodes taczanowskii, Thorell, St. Rag. Mal. etc. iv. 1890, p. 301 (nota).

♀. *Long.* 7–8 *mm.—Cephalothorax breviter ovatus, postice sat convexus, sublævis, parce et sat longe nigro-pilosus, luridus, valde nigro-variatus. Area oculorum macula nigra, postice breviter producta et truncata, pone oculos medios spatium longitudinale luteum et utrinque lineolam valde flexuosam includente obtecta, supra vittis latissimis valde appropinquatis et spatiis mediis luteis binis, antico subtriquetro postico ovato-transverso, tantum separatis, valde dentatis et sinuosis, et utrinque serie* *macularum lutearum valde inæqualium 5–6 includente notata, ad marginem utrinque maculis quatuor sinuoso-dilatatis et punctos luteos includentibus ornata. Margo clypei subrectus, utrinque vix convexus, haud prominulus. Oculi medii antici sat magni et rotundi, subcontigui, a margine clypei spatio diametro oculi fere duplo latiore sejuncti. Abdomen ovatum, albido-testaceum, supra valde nigro-striatum et punctatum, antice macula longitudinali apice utrinque dentata, prope medium macula longitudinali in medio leviter constricta, dein maculis transversis paulo arcuatis et subcontiguis tribus, postice spatio albidiore immaculato, sed supra mamillas maculis minoribus seriatis trinis decoratum, subtus in regione epigasteris vittis nigris tribus, media latiore, lateralibus divaricatis, in regione ventrali lineis nigris quatuor, mediis postice convergentibus apice contiguis et mamillas haud attingentibus, lateralibus interruptis et punctatis, ventre antice impressionibus binis magnis nigris et ovatis munito. Sternum inæquale, nigrum, antice, pone partem labialem, transversim luteum, macula media elongata antice posticeque tenuiter producta et utrinque maculis marginalibus luteis trinis notatum. Partes oris pedesque fulvo-lutei, laminæ maxillares extus late nigro-marginatæ, chelæ in parte basali late nigræ. Pedes longi et graciles, articulis cunctis (tarsis exceptis) valde et numerose nigro-punctatis et subannulatis, haud lineatis.*

♂. *Long.* 6–7 *mm.—Cephalothorax humilior, pictura pallidiore et confusiore. Pedes multo longiores, apice gracillimi, minutissime et parcissime nigro-punctati, sed apice femorum patellisque nigris. Pedes maxillares breves et robusti; femore valido; patella vix longiore quam lato; tibia patella longiore subparallela; tarso tibia circiter æquilongo, ad basin fere æquilato, dein multo angustiore et sensim attenuato, bulbo mediocri, lobo ovato, spina sat robusta, recta, lobo non multo longiore et apicem tarsi haud superante.*

A *S. maculata*, Holmb., cui valde affinis est, imprimis differt pedibus fere inordinate nigro-punctatis (in *S. maculata* regulariter nigro-annulatis), ventre nigro-vittato et impressionibus ventralibus nigris atque ovato-longitudinalibus (in *S. maculata* fere semicircularibus et rufulis).

A *S. globula*, Nicolet, angulis clypei minus prominulis, pictura cephalothoracis et pedum, ventre vittato, sterno late nigro-clathrato (in *S. globula* puncto medio punctisque marginalibus trinis minutis notato), impressionibus ventralibus multo majoribus facile distinguenda.

Insula Sancti Vincentii.

Habite une grande partie de l'Amérique centrale et de l'Amérique méridionale.

31. Scytodes hebraica, sp. nov. (Plate XLII. fig. 14.)

♀. *Long.* 6 *mm.—Cephalothorax breviter ovatus, postice convexus, sublævis, parce et sat longe nigro-pilosus, luridus, nigro-*

variatus: regione frontali transversim nigra, vitta dorsali latissima utrinque ramulos tres abbreviatos et truncatos emittente, antice, pone oculos medios, maculam parvam elongato-triquetram et pone oculos laterales utrinque maculam paulo majorem postice truncatam, dein lineam longitudinalem et in medio maculam magnam transversim ampliatam et papilioniformem gerente, utrinque vitta marginali angusta et linea submarginali angustiore valde flexuosa interrupta et arcus tres designante. Margo clypei evidenter emarginatus, utrinque ad angulum convexus. Oculi medii mediocres, subcontigui. Clypeus obliquus, oculis mediis saltem duplo latior. Abdomen globosum, albido-testaceum, valde nigro-punctatum et maculis majoribus inæqualibus, sæpe confluentibus, et zonas transversas formantibus decoratum, subtus inordinate nigro-marmoratum. Sternum fuscum, vitta media fulva sat angusta et apice haud attingente, notatum. Pars labialis fusca. Laminæ testaceæ, extus fusco-marginatæ. Chelæ testaceæ, antice late fusco-plagiatæ. Pedes graciles et longi, coxis fulvis apicibus fuscis, femoribus nigricantibus annulis quatuor sat angustis pallide luridis ornatis, reliquis articulis fuscis, tibiis annulis binis luteis (altero subbasilari, altero subapicali) et metatarsis annulo basilari simili notatis. Pedes-maxillares breves et robusti, luridi, femore anguste nigro-biannulato, patella tibiaque ad apicem infuscatis.

Insula Sancti Vincentii.

32. Scytodes bajula, sp. nov. (Plate XLII. fig. 15.)

♀. *Long. 4 mm.—Cephalothorax breviter ovatus, postice valde convexus, subtilissime coriaceus et parce nigro-pilosus, luridus et nigro-variatus: linea media exili apicem haud attingente, utrinque vittis dorsalibus latioribus binis, vitta interiore oculos medios attingente, postice abbreviata, leviter flexuosa et extus prope medium obtuse dentata, vitta exteriore oculos laterales attingente inæquali, usque ad apicem ducta et extus ramulos tres sat angustos et longos emittente, utrinque linea marginali dentata lineaque submarginali valde flexuosa et sæpe interrupta arcus tres designante. Margo clypei rectus, nec convexus nec emarginatus. Oculi antici sat magni, contigui. Clypeus oculis anticis circiter dimidio latior. Abdomen globosum, albo-testaceum, supra zonis transversis nigris latis et dentatis ornatum, subtus obscure testaceum, regione epigasteris nigra, regione ventrali parce nigropunctata et postice maculis majoribus binis arcuatis munita. Sternum fuscum, antice, pone partem labialem, transversim luteum, dein linea media angusta sed apice triangulariter ampliata et utrinque maculis binis transversis luteis notatum. Chelæ antice fuscæ, ad apices testaceæ. Pedes graciles, sat longi, obscure fulvi, coxis apicibus fuscis, femoribus anticis obscurioribus, late infuscatis et subannulatis, posticis ad apicem late fusco-annulatis, tibiis annulo medio annuloque apicali olivaceis vix expressis munitis. Pedes-maxillares breves et robusti, lutei, femore fere nigro, patella tibiaque late fusco-variatis.*

♂. *Long.* 4 *mm.—Feminæ subsimilis sed cephalothorace paulo humiliore, sterno antice latius testaceo et setis nigris spiniformibus erectis parce armato, pedibus multo longioribus, fere omnino luridis, femoribus 1[i] paris, prope medium utrinque setis reliquis longioribus munitis. Pedes-maxillares fusco-olivacei, bulbo rufulo; femore robusto versus basin incrassato; patella sat parva; tibia patella saltem dimidio longiore, latiore et ovata; tarso minuto, depressiusculo, sed apice abrupte angustiore, anguste recte et longe producto; bulbo subgloboso, spina lobo multo longiore tenuissima setiformi et recta.*

Insula Sancti Vincentii.

Se trouve aussi au Vénézuela.

33. Scytodes lineatipes, Tacz. (Plate XLII. figs. 16, 17.)

S. lineatipes, Taczanowski, Hor. Soc. ent. Ross. x. 1873, p. 107.

♀. *Long.* 4–4·5 *mm.—Cephalothorax breviter ovatus, postice validissime gibbosus, sublævis, parce et breviter nigro-pilosus, luridus, nigricanti-variatus: regione oculari in medio infuscata dein linea media exili abbreviata et utrinque lineis tribus, linea interiore subrecta leviter dentata et maculam frontalem attingente, linea intermedia antice abbreviata, postice convergente apiceque uncata, linea exteriore intermedia subsimili sed postice paulo magis producta extus dentata et ramulos abbreviatos 4 vel 5 emittente, vitta submarginali sat lata, valde flexuosa et dentata et inter vittam marginalem et lineas dorsales linea validissime sinuosa et plus minus punctata, postice, in declivitate, pone lineas dorsales exteriores, maculis parvis binis acute triquetris et lineis binis parallelis, leviter convexis et cariniformibus ornato. Margo clypei subrectus, sat angustus, ad angulos leviter convexus, haud productus. Oculi medii antici sat magni, rotundi et inter se juxte contigui, a margine clypei spatio diametro oculi saltem dimidio latiore sejuncti. Abdomen globosum, albo-testaceum, supra maculis nigris parvis inæqualibus et dentatis fere inordinate conspersum et in parte basali linea longitudinali utrinque ramulos abbreviatos valde flexuosos gerente ornatum, subtus punctis nigris minoribus conspersum. Chelæ, sternum pedesque lutea, chelæ antice nigro-bivittatæ. Sternum utrinque vitta fusca latissima et confusa, spatiis quatuor luteis notata, munitum. Pedes modice longi, graciles, femoribus subtus lineis nigris binis, in parte apicali plus minus interruptis et punctatis et antice punctis paucis seriatis ornatis, patellis apice minute nigro, tibiis annulo medio interrupto annuloque apicali integro notatis, metatarsis apicibus minutissime fuscis. Pedes-maxillares femore ad apicem patella tibiaque nigro-variatis.*

♂. *Long.* 4 *mm.—Feminæ subsimilis sed abdomine minore plerumque immaculato albido, postice late et confuse infuscato, pedibus longioribus et gracilioribus. Pedes-maxillares breves; femore robusto et subrecto; patella parva curvata; tibia patella circiter* $\frac{1}{3}$ *longiore et multo latiore, subglobosa; tarso tibia et patella simul sumptis longiore apice anguste producto; bulbi lobo breviter* *ovato, spina lobo multo longiore flexuosa, in medio leviter incrassata, apice paululum compressa, truncata et minute penicillata.*

Var. ♀. *Spatium inter lineas dorsales interiores omnino infuscatum et vittam latam formans, sed spatium angustum et lineare inter lineas intermediam et exteriorem pallidius et litteram* **V** *albidam designans, partes laterales sæpe confuse fusco-reticulatæ, pictura sterni et abdominis pallidior.*

Insula Sancti Vincentii.

Se trouve aussi au Vénézuela et en Guyane.

34. Scytodes fusca, Walck.

Scytodes fusca, Walck. Apt. i. 1837, p. 272.

Scytodes guyanensis, Taczanowski, Hor. Soc. ent. Ross. x. 1873, p. 108.

♀. *Long.* 4 *mm.—Cephalothorax breviter ovatus, postice valde gibbosus, subtilissime coriaceus et opacus, parce nigro-setosus, fusco-vel nigro-piceus, interdum concolor, sæpius lineis binis exilibus valde appropinquatis et rarius maculis marginalibus confusis obscure fulvo-rufulis ornatus. Margo clypei subrectus, utrinque leviter convexus, haud prominulus. Oculi medii antici sat magni subcontigui, a margine clypei spatio diametro oculi non multo latiore sejuncti. Abdomen subglobosum, nigrum, plerumque immaculatum, interdum vittis transversis sat latis flexuosis et in medio dentatis testaceis ornatum. Sternum nigro-piceum. Pedes mediocres, coxis, trochanteribus femoribusque fusco-piceis, reliquis articulis obscure fulvo-ravidis, rarius coxis testaceo-variatis et tibiis posticis subannulatis. Pedes-maxillares breves et robusti, fusco-picei, patella apiceque tarsi dilutioribus.*

Insula Sancti Vincentii.

Se trouve aussi au Vénézuela, en Guyane et au Brésil.

Gen. Drymusa, nov. gen.

Cephalothorax parum convexus, postice late truncatus, utrinque ample rotundus, antice sat abrupte attenuatus et fronte obtusa, stria thoracica parva tenui et remota. Oculi ut in Scytodi. *Sternum late cordiforme, haud vel vix longius quam latum, antice haud attenuatum, latissime et recte sectum, postice attenuatum sed truncatum, et coxæ posticæ inter se late distantes. Pars labialis maxima, ad basin spatium intercoxale totum occupans, multo longior quam lata, sensim attenuata, apice leviter convexa submembranacea et leviter excisa. Pedes gracillimi et longissimi, mutici. Mamillæ ut in* Scytodi, *sed inferiores distinctius separatæ. Regio epigasteris feminæ producta et apertura genitalis corneo-marginata.*

Ab *Loxosceli* præsertim differt sterno latius cordiformi, antice late et recte truncato, postice attenuato sed truncato et coxis posticis inter se distantibus, parte labiali ad basin spatio intercoxale haud angustiore etc.

35. **Drymusa nubila**, sp. nov.

♀. *Long.* 4 *mm.—Cephalothorax sublævis, pallide fusco-rufescens, parte cephalica lineolis exillimis quinque, media recta, lateralibus leviter sinuosis et antice oblique convergentibus et postice maculis binis magnis, elongatis, obliquis et contiguis, literam* **V** *magnam designantibus, notata, parte thoracica lineolis radiantibus vix expressis munita. Oculi subæquales, triangulum magnum occupantes. Clypeus oculis anticis plus triplo latior. Abdomen sat longe ovatum, nigrum, antice punctis duobus subgeminatis, dein lineis transversis tribus valde sinuosis et acute biangulosis ornatum, subtus regione epigasteris leviter convexa et rufescente. Sternum, chelæ, partes oris pedesque pallide fusco-rufescentia, sterno et parte labiali paulo obscurioribus, subtilissime coriaceis atque opacis, femoribus leviter infuscatis. Pedes parce et sat longe pilosi.*

Insula Sancti Vincentii.

5. Familia Caponiidæ[1].

Gen. Nops, MacLeay.

Cephalothorax ovatus, antice attenuatus et obtusus. Clypeus directus, oculis plus quadruplo latior. Oculi duo. Sternum planum, sat longe oblongum, antice posticeque attenuatum. Laminæ maxillares ad apicem vix attenuatæ atque obtusæ. Pedes mediocres, robusti, patellis longis, quatuor anticis tibiis $\frac{1}{3}$ *tantum brevioribus, tarsis biarticulatis, articulo basali apicali longiore et versus basin attenuato, subappendiculato, metatarsis quatuor anticis carina membranacea et calcare apicali subtus insigniter instructis.*

36. **Nops coccineus**, sp. nov. (Plate XLII. fig. 18.)

♀. *Long.* 8 *mm.*–9 *mm.—Cephalothorax sat humilis, ovatus, antice attenuatus et obtusus, læte fusco-coccineus, crebre et uniformiter coriaceo-rugosus et opacus, macula oculari nigra et rotunda. Oculi duo sat magni, late ovati et subrotundi, spatio diametro oculi fere dimidio angustiore inter sese distantes. Clypeus directus, oculis plus quintuplo latior. Abdomen longe oblongum, pallide testaceo-virescens, vitta media lata, dentata, antice acuta et marginem anticum haud attingente et utrinque vitta marginali nigra lata supra ornatum, interdum vitta media confuse rufulo-limbata, subtus immaculatum. Mamillæ testaceæ. Sternum fusco-coccineum, uniformiter et valde coriaceum. Chelæ fusco-rufulæ, læves. Pedes læte rufo-coccinei, coxis anticis paulo obscurioribus, metatarsis tarsisque cunctis paulo dilutioribus, femoribus robustis compressis et, præsertim anticis, subclavatis. Pedes-maxillares fulvo-rufescentes; tibia patella saltem* $\frac{1}{3}$ *longiore, a basi ad apicem leviter ampliata; tarso tibia longiore et crassiore, leviter ovato, supra albido subtus nigricanti-crinito.*

[1] Typus gen. *Caponia*, E. Sim. (=*Colophon*, Cambr., nom. præocc.).

♂. *Long.* 6–7 *mm.—Feminæ subsimilis sed pedibus longioribus. Pedes-maxillares fulvo-rufescentes; tibia patella saltem $\frac{1}{3}$ longiore, angusta et leviter curvata; tarso tibia et patella simul sumptis paulo longiore, sat anguste ovato, apice obtuso et nigro-crinito; bulbo maximo, globoso et depressiusculo, spina lobo breviore, antice valde arcuata, sat robusta, apice truncata et minutissime bifida.*

Insula Sancti Vincentii.

"Windward side, May and June: under stones, shady places. Hill-sides about 500 feet. Near Chateaubelais, Aug. and Sept., forest not far from sea-level, concealed in withered vines; others in forests in various places near Chateaubelais (rare)."—*H. H. S.*

Gen. Caponina, nov. gen.

Cephalothorax sat late ovatus, antice parum attenuatus et obtusus. Clypeus subverticalis, oculis vix duplo latior. Oculi duo magni et subcontigui. Sternum convexum, latissime cordiforme, haud longius quam latum. Laminæ maxillares ad apicem valde attenuatæ. Pedes mediocres, robusti, patellis sat parvis, cunctis subæqualibus et tibiis multo brevioribus, tarsis uniarticulatis, compressis et sat longis, quatuor anticis metatarsis non multo brevioribus, metatarsis anticis carina calcareque apicali carentibus.

37. Caponina testacea, sp. nov.

♀. *Long.* 4 *mm.—Cephalothorax lurido-testaceus, lævis et nitidus, macula oculari nigra magna notatus. Oculi magni, rotundi, inter se anguste separati. Clypeus obliquus, subverticalis, oculis haud duplo latior. Abdomen breviter ovatum, albido-testaceum, parce fulvo-pubescens et antice pilis nigris paucis longioribus munitum. Partes oris, sternum pedesque lurido-testacea, pedes, præsertim metatarsis et tarsis, sat longe cinereo-criniti. Chelæ antice setis nigris longis paucis erectis munitæ.*

Insula Sancti Vincentii.

6. Familia Drassidæ.

Drassidæ, ad part.; subfamilia *Drassinæ,* E. Sim. Ar. Fr. iv.

Gen. Sergiolus, nov. gen.

Herpyllus, Hentz, Bost. J. Nat. Hist. 1847–1850 (ad part. *H. variegatus*).

Cephalothorax anguste oblongus, parum convexus, antice parum attenuatus et fronte sat lata, stria media thoracica carens. Oculi antici subcontigui, in lineam rectam vel subrectam dispositi, medii lateralibus majores. Oculi postici parvi æquidistantes vel sæpius medici inter se remotiores, in lineam rectam seu leviter recurvam, parum remotam et linea antica evidenter latiorem ordinati. Area mediorum trapeziformis, non multo longior quam lata. Clypeus oculis anticis latior. Chelæ mediocres, marginibus sulci *muticis. Pars labialis fere triplo longior quam lata, fere parallela apice obtusa. Laminæ longæ, subrectæ, ad basin attenuatæ, extus ad apicem leviter dilatato-rotundæ. Sternum anguste oblongum, antice posticeque attenuatum. Pedes breves et robusti aculeati, metatarsis tarsisque anticis rare scopulatis.*

Ab *Aphantaulaci*, cui affinis est, imprimis differt parte labiali multo longiore quam lata et oculorum linea antica recta.

Typus hujus generis est *Herpyllus variegatus*, Hentz.

38. Sergiolus elegans, sp. nov.

♀. *Long.* 4 *mm.—Cephalothorax anguste oblongus, humilis, fulvo-rufescens, sat late fusco-marginatus, pilis longis, pronis albo-sericeis vestitus. Oculi postici æqui, in lineam plane rectam ordinati, medii inter se quam a lateralibus remotiores et spatio inter medios et laterales diametrum oculi vix æquante. Oculi antici in lineam subrectam dispositi, medii lateralibus fere duplo majores, inter se anguste distantes, sed a lateralibus juxte contigui. Abdomen sat longe oblongum, depressiusculum, albido-testaceum, niveo-pilosum, supra in parte prima maculis nigricantibus binis ovatis, in parte secunda maculis magnis binis subquadratis sæpe confluentibus et vittam transversam latam designantibus, et postice, supra mamillas, maculis binis minoribus elongatis et obliquis structe decoratum, subtus immaculatum. Mamillæ fulvo-testaceæ. Partes oris fulvo-rufescentes. Sternum pedesque luridi, pedes breves et robusti, tibiis quatuor anticis inferne in parte apicali aculeis binis debilibus uniseriatis et metatarsis ad basin aculeis binis armatis, tibiis metatarsisque posticis numerose aculeatis, metatarsis tarsisque anticis crasse et rare scopulatis. Plaga vulvæ sat parva, rufula, obtusissime triquetra, utrinque leviter depressa et marginata.*

A *S. variegato*, Hentz, differt oculorum serie postica recta, pictura cephalothoracis et abdominis.

Insula Sancti Vincentii.

7. Familia Palpimanidæ.

39. Otiothops oblongus, sp. nov.

♀. *Long.* 6 *mm.—Cephalothorax nigro-rufescens, tenuiter et crebre coriaceo-rugosus. Oculi medii postici parvi, plani, breviter ovati et obliqui, inter se spatio diametro oculi circiter duplo angustiore distantes. Oculi medii antici posticis saltem duplo majores, nigri, convexi et rotundi. Clypeus areæ mediorum circiter æquilatus. Abdomen oblongum, atro-testaceum, sericeo-pubescens, plagula epigasteri rufula postice truncata, nitida sed transversim striolata, munitum. Sternum nigro-rufescens, uniformiter granosum. Chelæ parce rugosæ, extus subtiliter carinatæ. Pedes ut in* O. amazonico *et* lapidicola, *antici rufo-castanei, reliqui fulvo-aurantii.*

Insula Sancti Vincentii.

Ab *O. lapidicola*, E. Sim., differt oculis mediis posticis minoribus

Fig. 1.

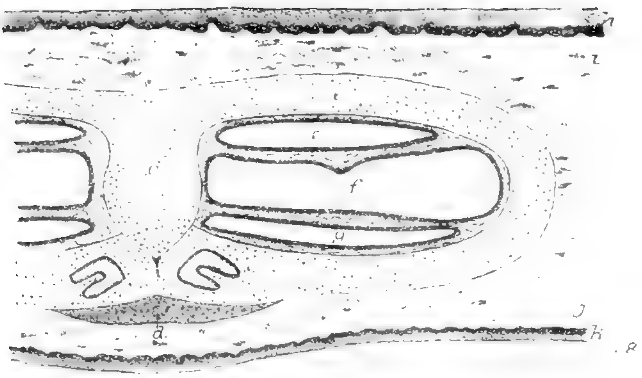


Fig. 2.

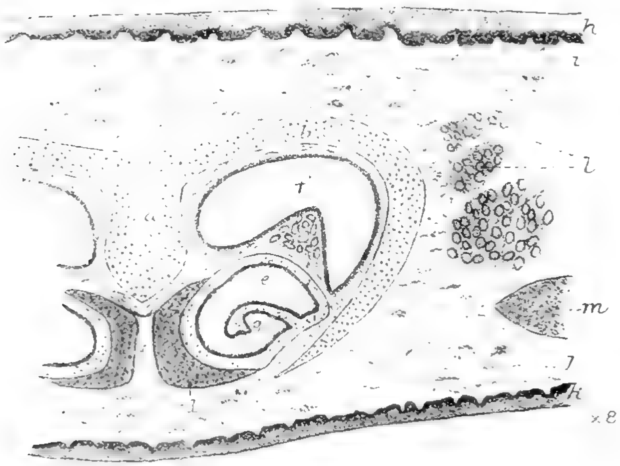
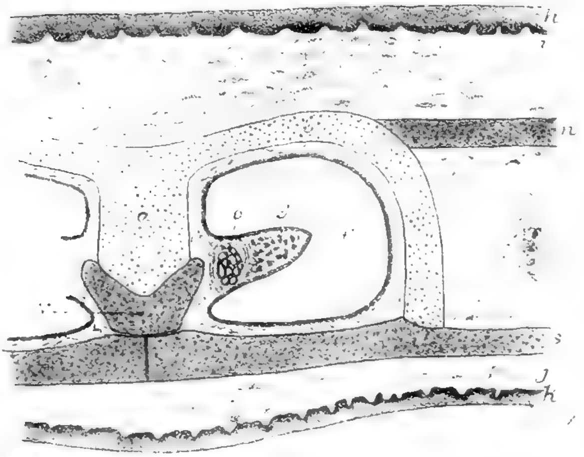


Fig. 3.



M. P. Parker lith.

West, Newman imp.

Structure of Ornithorhynchus.

Fig. 1

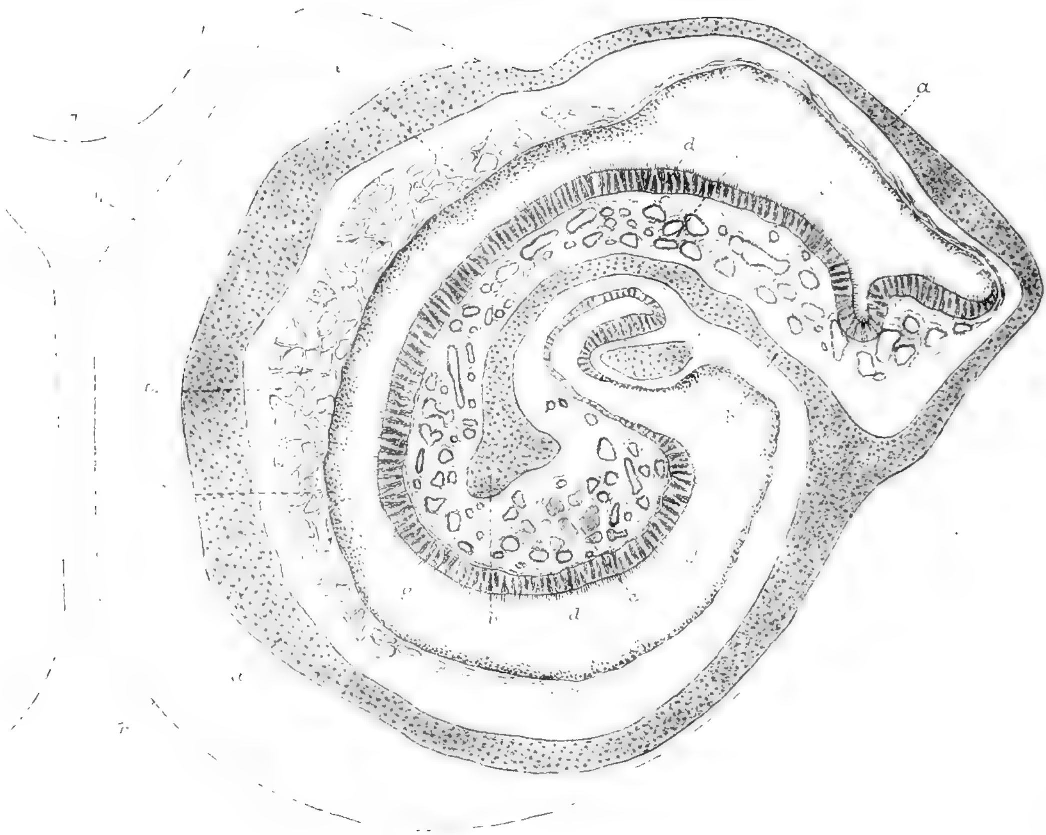
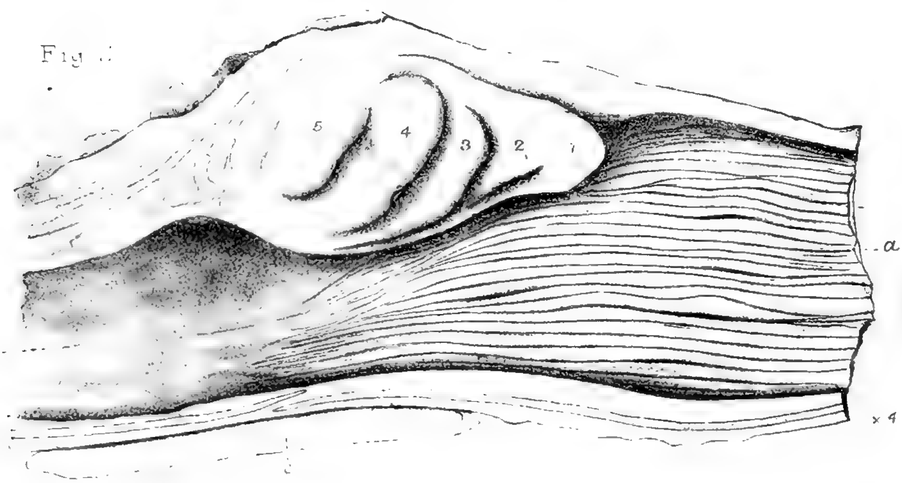


Fig. 2



M.P. Parker lith.

West, Newman imp.

Structure of Ornithorhynchus

et inter se distinctius separatis, pedibus sex posticis aurantiis, haud luteis; ab *O. amazonico*, E. Sim., præsertim differt cephalothorace longiore et humiliore. Ab *O. walckenaeri*, M'Leay (sp. quæ mihi est ignota), verisimiliter distinctus est.

EXPLANATION OF PLATE XLII.

Fig. 1. *Dysderina principalis*, p. 557. Lateral view of palp. of ♂.
2. *Dysderina spinigera*, p. 558. Leg.
3. —— ——. Palp. of ♂, lateral view.
4. *Pelicinus marmoratus*, p. 559. Lateral view of palp. of ♂.
5. *Opopæa deserticola*, p. 560. Lateral view of palp. of ♂.
6. *Oonops spinimanus*, p. 563. Lateral view of leg.
7. *Oonops globimanus*, p. 563. Lateral view of palp. of ♂.
8. *Oonops pulicarius*, p. 564. Lateral view of palp. of ♂.
9. *Oonops figuratus*, p. 564. Abdomen from above.
10. *Ochyrocera arietina*, p. 566. Lateral view of palp. of ♂.
11. *Ochyrocera quinquevittata*, p. 566. Lateral view of palp. of ♂.
12. *Theoclia radiata*, p. 567. Lateral view of palp. of ♂.
13. *Scytodes longipes*, p. 567. Lateral view of palp. of ♂.
14. *Scytodes hebraica*, p. 568. Cephalothorax from above.
15. *Scytodes bajula*, p. 569. Lateral view of palp. of ♂.
16, 17. *Scytodes linearipes*, p. 570. Cephalothorax from above.
18. *Nops coccineus*, p. 572. Lateral view of palp. of ♂.

4. On the Nose, the Organ of Jacobson, and the Dumb-bell-shaped Bone in the Ornithorhynchus. By JOHNSON SYMINGTON, M.D., F.R.S.E., Lecturer on Anatomy, Minto House, Edinburgh[1]. (Communicated by FRANK E. BEDDARD, M.A., F.Z.S.)

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(Plates XLIII. & XLIV.)

Notwithstanding the great amount of attention that has been devoted to the anatomy of the Ornithorhynchus since its discovery nearly a century ago, its nasal cavities appear to have been, to a large extent, overlooked.

Meckel (1), Owen (2), Albrecht (3), Turner (4), Zuckerkandl (5), and Parker (6) have examined and described certain portions of the nose, but no account of its microscopic structure appears to have hitherto been published, and several points in its naked-eye anatomy have been overlooked or misinterpreted.

The following communication is based upon the study of a series of coronal sections of the head of a nearly adult female, together with the examination of several dissected specimens and macerated skulls. The sections were cut after having been decalcified and embedded in paraffin. Most of the Ornithorhynchi which have reached this country have not been sufficiently well preserved to admit of their microscopic examination, and I am greatly indebted

[1] From the Embryological Laboratory, University of Edinburgh.

to one of my Australian pupils, Mr. C. Hardcastle, not only for procuring me the specimen, but also for the trouble he took to have it carefully hardened.

In consequence of the elongated form of the face, the position of the nostrils towards the anterior end of the beak, and the prolongation of the hard palate backwards nearly as far as the glenoid cavity, the nasal cavities are of considerable length. In my specimen, which measured 37 cm. from the tip of the bill to the posterior extremity of the tail, the nasal cavities were 6 cm. in length. Males are considerably larger than females, and Mr. Oldfield Thomas (7) found the basal length of the skull of an adult male, measured from the basion to the anterior end of the premaxillary bones, to be 10·8 cm. The nasal cavities are not, of course, equal to the basal length of the skull, but in this male they would be quite 8 cm.; while the nasal cavities are very long their transverse and vertical diameters are very slight, so as to make their naked-eye examination somewhat difficult. The anterior parts of the nasal cavities are flattened, like the bill, from above downwards, and here the transverse diameter is about 4·5 mm. and the vertical extent scarcely 2 mm. Farther back, under the cranial cavity, and especially in the region of the turbinated processes, the nasal cavities are much deeper, measuring from the roof to the floor 5 mm., while their transverse diameter is almost obliterated by the projection of the turbinals from the outer wall.

Vertical transverse sections of the nasal cavities immediately behind the nostrils show a subdivision of each cavity into 3 compartments—superior, middle, and inferior (see Plate XLIII. fig. 1). The two septa between these compartments are formed by the lining membrane of the nose, which is here composed of dense connective tissue, the matrix of which is only slightly fibrillated, and of stratified squamous epithelium. The septa are not supported by any skeletal framework, but contain a few small glands the ducts of which open into the middle compartment. Serial sections show that the septa commence anteriorly as horizontal ridges projecting from the sides of the partition between the two nostrils and unite with the outer walls of the nasal cavities just behind the two nostrils. In my sections the middle compartment is always larger than the others, but this difference becomes more obvious as one passes backwards, the superior and inferior compartments gradually becoming smaller and ultimately end blindly, while the middle one becomes continuous with the main cavity of the nose. The two cæcal pouches extend backwards to a little beyond the anterior end of Jacobson's organ and nearly as far as the naso-palatine foramen. Their length is about 3 mm., and the upper is a trifle longer than the lower.

J. F. Meckel is the only author who, so far as I have been able to ascertain, makes any reference to this peculiar arrangement. In plate vii. fig. 8 of his classical work on the Ornithorhynchus (1), he gives a view of the anterior part of the right nasal cavity with its three divisions. He exposed them by cutting through the outer wall of the nose and turning its roof over to the left side. Meckel considers the septa already described to be valves, and he concludes that in the absence of any muscles for closing the nostrils such valves must be very useful to an animal with the aquatic habits of the Ornithorhynchus. Various aquatic mammals, such as the Seal, possess a powerful sphincter muscle for closing the nostrils when diving, but I know of no animal with a structure like that in the Ornithorhynchus. The function of these septa is very doubtful. They do not appear in my sections to be sufficiently large and free to meet one another so as to close the anterior part of the nose: further, it is obvious that were they to do so they would constitute a serious obstacle to inspiration of air through the nose.

The Organ of Jacobson.

Numerous papers have been published recently on the structure and relations of this organ in various mammals, but scarcely anything appears to be known with reference to its condition in the Ornithorhynchus. Indeed Sir W. Turner (4) and the late Professor W. K. Parker (6) seem to be the only anatomists who have given any account of the organ. Sir W. Turner, when investigating the relations of the naso-palatine foramen to the dumb-bell-shaped bone, ascertained that a bristle passed from the mouth into this foramen entered a cavity which extended backwards for some distance in relation to the nasal septum. Turner considered that this cavity with its walls formed the organ of Jacobson. On opening the nasal chamber he found that this organ formed a ridge projecting from the side of the nasal septum halfway across the cavity. Prof. Zuckerkandl (5) also recognized this ridge and figured it (see plate i. fig. 2 of his work), but he did not associate it with Jacobson's organ, and merely stated that it increases the mucous surface and diminishes the anterior part of the nasal cavity.

Professor Parker in his "Mammalian Descent" (the Hunterian Lectures for 1884) referred as follows to Jacobson's Organ:—"In my young specimen of Ornithorhynchus (the size of a moderate fist, with the hair appearing) these parts and their capsules are as large as in Serpents and Lizards," p. 52. He gave no further description of the organ in the Ornithorhynchus, but mentioned it as one of the Reptilian characters of the Prototheria.

We know from the researches of Jacobson, Gratiolet, Balogh, Klein, Herzfeld, Schwink, Kölliker, Gegenbaur, and others that Jacobson's organ exists in the great majority of mammals in which it has been looked for. Its structure, however, is comparatively rudimentary, especially in the higher Mammalia. Its existence in man is disputed, and even if present it is very feebly developed. It is absent in Birds, and until recently this was supposed to be the case also in the Crocodilia. Professor Howes (8) has, however, brought before this Society strong evidence of its existence in the *Caiman niger*. It is well known to exist in the Ophidia and Lacertilia, indeed it is in these groups that it is supposed to attain its maximum development. Its condition in the lower Mammals, and especially in the Prototheria, is, therefore, a subject of considerable morphological interest.

My series of coronal sections pass through the entire organ, which fortunately was sufficiently well preserved to admit of a satisfactory microscopic examination.

As there is no distinct external nose and the anterior part of the nasal cavity is not complicated by the presence of turbinated processes, we should expect the cartilaginous framework of the nose of the Ornithorhynchus to be comparatively simple, and such will be found to be the case. Thus a coronal section through the nose about midway between the nostrils and Stenson's ducts shows a central bar of cartilage forming the nasal septum. This cartilage divides above into two lateral plates, each of which first curves outwards, then downwards, and lastly turns inwards to end, in close contact with the one of the opposite side, just below the nasal septum. It is in the somewhat thickened inner extremity of this lateral plate that the anterior part of Jacobson's organ is embedded (see (*c*) on fig. 1 of Plate XLIII.). A little farther back the cartilaginous floor of the nose is perforated by the naso-palatine foramen or Stenson's duct. This foramen passes from the mouth into the nose on the outer side of Jacobson's organ, while the cavity of the organ itself opens on the inner wall of the foramen. These relations of the naso-palatine foramen and the duct of Jacobson's organ are those which Herzfeld (9) found to exist in the majority of mammals. The piece of cartilage lying to the inner side of the naso-palatine foramen forms the cartilaginous framework of Jacobson's organ, and in all coronal sections, from the level of the foramen backwards to the posterior end of the organ, its cartilage is seen as an independent mass having no direct connection with either the nasal septum or the cartilage in the floor of the nose. We thus see that the cartilage of Jacobson's organ in this animal is continuous, in front of the naso-palatine foramen, with the cartilage in the floor of the nose, while behind this it appears in coronal sections as a separate structure. With the exception of the parts at the naso-palatine foramen and near its posterior extremity, the cartilage forms a complete investment for Jacobson's organ. At the naso-palatine foramen it is perforated for the passage of the duct from Jacobson's organ into the foramen, while posteriorly it is open for the passage into it of branches of the olfactory nerve and of glandular tissue. The cavity enclosed by the cartilaginous capsule is partially divided into two compartments by a bar of cartilage which passes from the outer side upwards and inwards towards the inner wall. This septum, which is continuous with the cartilaginous capsule, varies in its form at different levels. Thus in front of the naso-palatine foramen the septum is nearly straight (see fig. 1, Plate XLIII.), but behind the opening it is turbinated, curving downwards and inwards (see fig. 2, Plate XLIII.; and fig. 1, Plate XLIV.).

The cartilaginous framework of Jacobson's organ in the Ornithorhynchus will be found to differ considerably from that of any of the Eutheria in which it has been described. Thus in the Sheep

(10), Guinea-pig (11), Rabbit (12), and Dog (13) it forms a less complete capsule, and in no transverse vertical section is it seen in continuity with the cartilage in the outer wall of the nose. Further, in none of these animals is there any trace of a simple or turbinated septum which is so well developed in the Duck-mole. I am not aware of any published account of its condition in the Marsupialia, but in a young *Macropus giganteus* which I examined there were no indications of a turbinal, and the general form and position of the organ were very similar to that in the Guinea-pig as figured by Dr. Klein. Professor W. N. Parker (14) has recently shown that the Echidna possesses a largely developed Jacobson's organ which has a well-marked turbinal. So far, therefore, as our present knowledge goes, it appears that it is only in the Prototheria amongst mammals that any arrangement of the cartilage of Jacobson's organ exists by which the extent of the epithelial surface lining the organ is increased. In various mammals the cartilage of Jacobson's organ attains a large size, while the lumen of the organ is of microscopic size. This is probably an indication that the sensory part of the organ has degenerated more rapidly than its cartilaginous support.

In the Lacertilia and Ophidia the skeletal framework of Jacobson's organ contains a turbinal, and it is in these animals that the organ is generally considered to attain its highest development. Thus Dr. J. Beard (15) writes as follows:—"Indeed an examination of the literature of Jacobson's organ clearly shows that just in the group of animals, the Reptilia, in which alone it can be considered as something more than a rudimentary organ, a thorough comparative investigation is a desideratum" (p. 757).

I am inclined to believe that this statement of Dr. Beard will require modification, and that further research will show that Jacobson's organ attains its highest development in the Prototheria. My own observations amongst the Reptilia are limited to its examination in *Anguis fragilis* and *Pelias berus*, in neither of which does it appear to me to be so well developed as in the Ornithorhynchus.

The arrangement of the structures forming the soft parts of Jacobson's organ are shown in fig. 1, Pl. XLIII., which represents a transverse section behind the naso-palatine foramen and about the middle of the posterior swelling of the dumb-bell-shaped bone. It will be seen that there is a very marked difference in the structure of the soft parts lining the general cartilaginous capsule (*a*) and that covering the turbinated ridge (*b*). The turbinal cartilage is covered by some connective tissue, external to this is a thick layer composed mainly of blood-vessels and glandular tissue, while the free surface is provided with a layer of ciliated columnar epithelium. On the other hand, the structures lying on the concave surface of the cartilaginous capsule are evidently nervous. Next the cartilage are numerous small bundles of non-medullated nerve-fibres, which are separated from the sensory cells by a thin layer of connective tissue. In my specimen this sensory layer contains a large number of oval or rounded cells with distinct nuclei, but there are no columnar epithelial cells next the free surface such as are generally found. It is possible that these have been detached.

In the Guinea-pig, Dog, and Rabbit Dr. Klein found the organ of Jacobson to be flattened from side to side with the outer wall pushed slightly inwards, so that on transverse vertical section the organ was kidney-shaped. The outer wall was covered with ciliated columnar epithelium, while the inner wall possessed, in addition to ordinary columnar cells, special sensory cells. The outer wall of the organ in these mammals evidently corresponds to that covering the turbinated process in the Ornithorhynchus, while the inner wall is represented by the structures lining the general cartilaginous capsule.

In all mammals so far as at present investigated, except the Monotremes, the cavity of Jacobson's organ communicates anteriorly with the nasal chamber or with Stenson's duct, and this opening is anterior to the cavity of the organ. We have already seen that this is not the case in the Ornithorhynchus, where the cavity extends forwards as well as backwards from its opening into Stenson's duct. In Lizards the duct from Jacobson's organ passes backwards and downwards to open into the cavity of the mouth.

The cavity of the organ of Jacobson in the Ornithorhynchus is about 5 to 6 mm. in length. Both extremities end blindly, the posterior one just in front of the hinder end of the dumb-bell-shaped bone.

The ridge on the inner wall of the nose caused by Jacobson's organ is prolonged backwards nearly 3 cm. beyond the termination of the organ proper. The ridge here consists of glandular tissue and bundles of olfactory nerve-fibres, the nerves being internal to the glandular tissue (see fig. 3, Plate XLIII.).

The nasal cavity is lined by stratified squamous epithelium until near the posterior end of Jacobson's organ, where it becomes gradually replaced by columnar epithelium.

A transverse vertical section of the nose (see fig. 3, Plate XLIII.) about 1·5 cm. behind the nostrils shows that the walls of the nose are still mainly cartilaginous; the floor, however, contains the palatine process of the superior maxillary bone, and the lower part of the nasal septum the vomer.

The Dumb-bell-shaped Bone.

Since 1879, when Professor Albrecht (**3** *a*) published his first paper dealing with the ossification of the inter-maxillary bone, there has been a vigorous controversy as to whether this bone is normally developed in man and the higher mammals from one or two centres. The embryological evidence in favour of two centres appears to me to be unsatisfactory, the careful observations of T. Kölliker (**16**) and Schwink (**17**) being strongly in favour of its formation from a single centre.

Albrecht's (**3**) views as to the morphology of the dumb-bell-shaped bone in the Ornithorhynchus have, however, been pretty generally accepted. He directed attention to the fact, previously noticed by Rudolphi, Meckel (**1**), and Owen (**2**), and since confirmed by Turner (4), that in this animal the premaxillary bone consists of two entirely distinct and separate portions, an outer and an inner. Of these two the inner unites with its fellow of the opposite side to form a small dumb-bell-shaped bone, *l'os paradoxe* of Albrecht. As the Ornithorhynchus is the only mammal in which this arrangement of the premaxillary bone exists, it appeared to me that its position and relations were worthy of a more detailed examination than they have yet received. J. F. Meckel and Owen have described its general form when looked at from below, while Albrecht and Turner have shown its relations to the naso-palatine foramen. I propose now to demonstrate from my serial sections its relations to the cartilages of the nose and to Jacobson's organ.

When looked at from below, this bone is seen to consist of two rounded nodules placed one in front of the other and united by a narrow portion. Of the two nodules, the anterior is the smaller. The naso-palatine foramen lies just external to the constricted portion. Its total length in the adult is about 7 mm., and the breadth of the posterior swelling 5 mm.

The anterior nodule does not reach quite so far forward as the nostrils, but extends a little beyond the anterior end of Jacobson's organ. On transverse section (see fig. 1, Pl. XLIII.) it is seen to form a thin layer of bone, flattened from above downwards. It is separated from the cavity of the mouth by the mucous membrane of the hard palate and some loose connective tissue, while its upper surface lies in close relation to the cartilages of the nose which contain Jacobson's organ. As it passes backwards it gets thicker and develops a median ridge on its upper surface, which passes upwards between the two plates of cartilage containing Jacobson's organ. Opposite the naso-palatine foramen its vertical extent is about twice that of its transverse, and its external surfaces are concave and lodge the inner part of the cartilage of Jacobson's organ.

A section through about the middle of the posterior nodule of the bone shows that it possesses the same general form as at the naso-palatine foramen. It appears here as composed of two crescents with their convexities directed inwards, and the greater breadth of the bone is due to the elongation of the horns of the crescents, which reach about halfway round the organ of Jacobson and are in close contact with its cartilage.

In the greater part of its extent the bone is covered on its oral aspect by mucous membrane and a thin layer of submucous tissue, but near its posterior extremity also by a layer of cartilage. This is effected by an extension inwards to the middle line of the plates of cartilage which at the naso-palatine foramina lie external to these openings.

The dumb-bell-shaped bone from its position in relation to the cartilages of the nose is evidently ossified in the membrane investing them. In some places the ossific process has involved the whole of the tissue up to the cartilage, so that the bone and cartilage are in direct contact; as a rule, however, there is a thin layer of connective tissue between the bone and cartilage.

The relation of the bone to the organ of Jacobson corresponds essentially to that of the palatine process of the premaxilla in various mammals.

Turbinated Processes.

The only author who appears to make any reference to these processes is Prof. Zuckerkandl (5). In fig. 1 of plate i. of his work he gives a drawing of the external wall of the left nasal cavity as exposed by a sagittal section immediately to the left of the septum nasi. For the sake of comparison, I divided the posterior part of the nose in my specimen in a similar manner. The right part, consisting of the right nasal cavity and septum nasi, was divided in a transverse vertical direction and the sections mounted for microscopic examination, while the outer wall of the left nasal cavity was preserved for naked-eye examination.

The result of my investigations differs considerably from those of Professor Zuckerkandl; and I think it extremely probable from the drawing he gives that his specimen had been partially macerated or at least imperfectly preserved. Zuckerkandl divides the turbinated processes into a "Nasenmuschel" (maxillo-turbinal) and three "Reichwülste" (ethmo-turbinals). The former he describes as belonging to the group of "gefalteten Nasenmuscheln" (p. 10). These are turbinals which show on their free surface some longitudinal grooves.

I am satisfied that the maxillo-turbinal constitutes a well-marked example of the branching variety (verästigte Muschel) such as is found in the common Seal. Transverse sections show that the turbinal springs from the outer wall and that its branches almost entirely fill the corresponding part of the nasal cavity, reaching close to the nasal septum. The turbinal is pretty well ossified, but the smaller branches are often tipped with cartilage. Unfortunately in my specimen the spirit had not penetrated properly into this part of the nose, so that the character of the mucous membrane covering them could not be properly determined. In a well-macerated skull kindly lent me by A. Wilson, Esq., L.D.S. (Edin.), the branches of this turbinal can be easily recognized. The maxillo-turbinal extends backwards so as to lie partly below the ethmo-turbinals, but it is separated from the latter by a well-marked groove.

The ethmo-turbinals (Reichwülste) are described by Zuckerkandl as three in number. The majority of Osmatic mammals have five, and I think this number can be distinguished in the Ornithorhynchus (see fig. 2, Plate XLIV.).

The olfactory bulbs and ethmo-turbinals are present, but only moderately well-developed in this animal; it therefore belongs to the group named by Sir W. Turner (4 *a*) Microsmatic.

The soft palate was about 1 cm. in length, and the epiglottis projected upwards behind it. In another adult specimen in my possession I found a similar intra-narial position of the epiglottis.

Appendix.

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EXPLANATION OF THE PLATES.

Plate XLIII.

Fig. 1. Transverse vertical section of nasal cavities behind nostrils and in front of naso-palatine foramina.
- (*a*) Septal cartilage of nose.
- (*b*) Cartilage in roof of nose.
- (*c*) Cartilage in floor of nose just external to cavity containing Jacobson's organ.
- (*d*) Dumb-bell-shaped bone.
- (*e*) (*f*) (*g*). Three compartments of anterior part of nasal cavity.
- (*h*) (*i*). Integument of upper surface of bill; (*h*) its epithelial portion, (*i*) its subepithelial connective tissue.
- (*k*) (*j*). Integument of under surface of bill.

Fig. 2. Transverse vertical section of nasal cavities behind naso-palatine foramina and through about middle of posterior swelling of dumb-bell-shaped bone.
- (*e*) Cartilaginous capsule of Jacobson's organ.
- (*g*) Its turbinal cartilage.
- (*f*) Nasal cavity.
- (*m*) External portion of premaxillary bone.
- (*l*) Large nerve external to nasal cavity.
- Other letters same as in fig. 1.

Fig. 3. Transverse vertical section of nasal cavities behind Jacobson's organ and in front of turbinated processes.
- (*v*) Vomer.
- (*o*) Olfactory nerve-fibres and (*g*) glandular tissue in ridge on inner wall of nasal cavity.
- (*n*) Nasal bone.
- (*s*) Palate-process of superior maxillary bone.
- Other letters same as in fig. 1.

Plate XLIV.

Fig. 1. Same section as figure 2 of Plate XLIII., but showing Jacobson's organ more highly magnified, drawn with camera.
- (*h*) Dumb-bell-shaped bone.
- (*a*) (*a*) Cartilaginous capsule of Jacobson's organ.
- (*b*) (*b*) Its turbinal cartilage.
- (*c*) Layer containing blood-vessels and glandular tissue.
- (*d*) Ciliated columnar epithelium.
- (*e*) Layer of nerve-fibres.
- (*f*) Sensory epithelium.
- (*g*) Cavity of Jacobson's organ.
- (*i*) Septal nasal cartilage.

Fig. 2. View of outer wall of left nasal cavity, opposite turbinated processes.
- (*a*) Maxillo-turbinal, anterior extremity not shown.
- (1) (2) (3) (4) (5) are the five ethmo-turbinals.
- (*b*) Nasal cavity behind the turbinals.
- (*c*) indicates position, on under surface of specimen, of the posterior horny plate.

5. On a Mammalian Tooth from the Wealden Formation of Hastings. By A. Smith Woodward, F.Z.S.

[Received November 17, 1891.]

The estuarine conditions under which the Lower Cretaceous Wealden Formation was deposited are precisely such as have favoured the preservation of so many mammalian remains in several of the Tertiary strata. The existence of Mesozoic Mammalia being well ascertained, it is thus somewhat remarkable that no trace of the Class has hitherto been recorded from any locality in the great area of S.E. England and W. Europe occupied by the fossiliferous sands and clays of the Wealden period. In the underlying Purbeck Beds, it is true, mammalian remains have only been met with in one thin stratum in the cliffs of Durdlestone Bay, notwithstanding the fact that this series of rocks is likewise in great part of estuarine origin. However, in all cases in which Mesozoic Mammalia have been discovered, whether in Europe or America, they are invariably restricted to certain definite thin layers or to irregular accumulations of the débris of plants and Vertebrata ("bone-beds") of local occurrence and limited extent.

One of these irregular bone-beds in the Wadhurst Clay of the Wealden Formation has at last yielded the first evidence of a European Cretaceous Mammal. The specimen is merely a detached tooth, but quite sufficient for recognition. It was discovered by Mr. Charles Dawson, of Uckfield, in an irregular mass of comminuted fish- and reptile-bones, with scales and teeth, occurring in lenticular patches at one definite horizon in a quarry near Hastings. Mr. Dawson has for a long period been engaged in a careful examination of the deposit,

Fig. 1.

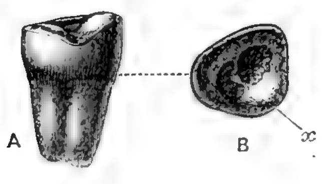


Fig. 2.

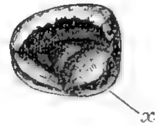


Fig. 1. *Plagiaulax dawsoni*, sp. nov.; inner (A) and coronal aspect (B) of [? second left lower] molar, four times nat. size.—Wealden (Wadhurst Clay), Hastings.

Fig. 2. *Plagiaulax minor*; coronal aspect of right lower molar 2 (not reversed in drawing), eight times nat. size.—Middle Purbeck, Durdlestone Bay.

and this is the first fossil met with presenting sufficient resemblance to a mammalian tooth to seem worthy of forwarding to the British Museum for special determination.

The tooth in question is shown of four times the natural size in the accompanying woodcut (fig. 1), A being the side view, and B displaying the coronal aspect. It has been extricated from the matrix as far as possible by the skilled hand of Mr. Richard Hall, but one side still remains attached and is thus obscured. In side view (fig. 1, A) the low enamelled crown is shown supported by two roots, which are robust, of nearly equal size and depth, incompletely separated in the upper half and terminating obtusely. So far as can be ascertained these are the sole roots, being apparently almost as wide as the crown. The coronal surface (fig. 1, B) is somewhat longer than broad, half as wide at one end as at the other, with one of the lateral margins rounded, almost angulated. It is much abraded, evidently the result of wear during the life of the animal, and the enamel is thus removed except quite at the border. The highest elevation (x) is large and obtuse, occupying one half of the gently rounded lateral margin of the tooth, and connected with a short spur which extends to the middle of the crown. There is evidence of a smaller elevation, crescentic in form, on the margin of the other half of the tooth; and the lateral margin opposite and adjacent to the most elevated portion forms a slight rim with feeble traces of crenulated enamel.

A detached tooth, and more especially a worn tooth, certainly does not suffice for generic and specific determination. The most striking feature of the specimen now described, however, is its close resemblance to the multituberculate *Microlestes*-type of molar, so common among Mesozoic Mammals and apparently retained in the true dentition of the existing Monotreme, *Ornithorhynchus*[1]. It only seems to differ in the extraordinary amount of wear to which the crown has been subjected, and in the appearance of this abrasion not having been produced entirely by an upward and downward or antero-posterior motion, of which the jaws of the known Multituberculata seem to have been alone capable.

This apparent divergence of character may, nevertheless, be deceptive; and on comparing the Wealden tooth with the posterior true molar of the Purbeckian genus *Plagiaulax* (fig. 2, p. 585), the extent of the correspondence in the configuration of the coronal aspect is certainly remarkable. One lateral border (the inner) is much more elevated than the other (the outer) in both cases; and the largest cusp in each is at the antero-inner angle.

In the absence of further evidence, it thus appears advisable to assign the new tooth to the genus *Plagiaulax*, of which it will represent a species larger than any hitherto described. If, moreover, the specimen should prove to be the ultimate lower molar of this genus, it is sufficiently distinguished from any known form by the shape of the crown; and, until the acquisition of further material, the species in question may bear the provisional name of *Plagiaulax dawsoni*, in honour of its discoverer. Mr. Dawson has already enriched the British Museum with many fine portions of the Wealden Reptilia; and there is now much hope that his further researches in the bone-beds will add the long-expected series of Wealden Mammalia.

[1] O. Thomas, Proc. Roy. Soc. 1889, vol. xlvi. p. 126.

6. On the Dates of the Parts, Plates, and Text of Schreber's 'Säugthiere.' By C. Davies Sherborn, F.Z.S.

[Received October 10, 1891.]

Many difficulties in synonymy have arisen from lack of information as to the dates of publication of Schreber's 'Säugthiere,' a work which commencing in 1774 was not completed until 1855. The following determinations have been arrived at by searching through contemporaneous literature. Unfortunately no copy of the book still preserving the original wrappers of the parts has come to my hands, and the evidence of dates is, with one or two exceptions, derived from periodical publications. In every case a reference to the authority quoted is given.

The list is still imperfect, but the dates of all the more important parts have been determined; blanks have been left for the insertion of further particulars, information about which I shall gratefully receive.

The following is the general description of the work:—

Schreber, Johann Christian Daniel. Die | Säugthiere | in | Abbildungen nach der Natur | mit Beschreibungen. | *Erlangen* (Walther).

Th. I., title, Vorrede (4 pp.) title, 1–190 pp., 62 pls., **1775**.
Th. II., pp. 191–280, pls. 63–80, **1775**.
Th. III., title, pp. 281–590, pls. 81–165, **1778**.
Th. IV., title, pp. 591–936, pls. 166–240, **1792**.
Th. V. (pt. 1), pp. 937–1112, pls. 241–347 and various supplementary plates, [thence continued by August Goldfuss, whose "notice" is dated "Erlangen, im März, 1817"], pp. 1113–1272, [thence continued by Johann Andreas Wagner], pp. 1273–1472.
Th. V. (pt. 2), pp. iv, 1473–1840, various plates.
Th. VI., pp. xvi, 1–520, pls. 308–328.
Th. VII., pp. viii, 1–428, pls. 329–385.

Supplementary Volumes, also by J. A. Wagner:

I., pp. xiv, vi, 1–551, pls. 1–62, **1840** [completed in 1839].
II., pp. viii, 1–558, pls. 63–84, **1841**.
III., pp. xiv, 1–614, pls. 85–165, **1843**.
IV., pp. xii, 1–523, pls. 168–327, **1844**.
V., pp. xxvi, 1–810, pls. 1–51, **1855**.

The following are the details of the separate parts. The authorities for the dates are given at the end of each "Heft." The contents of each Heft up to 64 are given from an original copy of Goldfuss's circular, fortunately preserved in an early copy of the work now in the Natural History Museum, which was brought to my notice by Mr. J. Saunders of the Zoological Library; Goldfuss, however, does not give a single date!

Th. **I.**, Heft	**1**,	pp. 1–8,	pls. 1–8.		[1774.]	
	2,	,, 9–48,	,, 9, 11–17.		1774.	Gött. g. Anz., 31 Dec. 1774, Zug. p. ccccix.
	3,	,, 49–56,	,, 18–24, 26.			
	4,	,, 57–64,	,, 27–34.		1774.	G. g. A., 28 Oct. 1775, Zug. p. cccxl.
	5,	,, 65–80,	,, 5 [to replace], 22 B. 35–39 A, B.			
	6,	,, 81–96,	,, 40 A, B–46.			
	7,	,, 97–120,	,, 47–54.			
	8,	,, 121–128,	,, 25, 55–59, 61, 62.		1774.	G. g. A., 13 July 1776, Zug. p. ccxxii, says all Th. i. "ist mitten im Junio 1774 . . . fertig worden," but does not say it was issued: Beckmann, Phys. Oek. Bibl. v, 1774, p. 569, reviews the first 8 Hefte.
	9,	,, 129–190,	,, 2 B, 10, 19 B, 46 A, 60 & title.		[1774.]	
Th. **II.**, Heft	**10**,	,, 191–206,	,, 63–70.	pls. 63–80 were issued in 1774, see G. g. A. 1776, Zug. p. ccxxii.	[1775.]	
	11,	,, 207–214,	,, 71 A, B–77.		[1775.]	
	[1] **12**,	,, 215–222,	,, 77 B–80.		1775.	Allg. deutsch. Bibl. xxxiii. 1778, p. 572 "zweeter Theil, 1775, 11 bogen [44 pp.], 20 Taf."
	13,	,, 223–230,	,, 81–92.			
	14,	,, 231–254,	,, 93, 95–97 A, B–100.			
	15,	,, 255–280,	,, 101–107 A, B.		[1775.]	
Th. **III.**, Heft	**16**,	,, 281–289,	,, 94, 108–114.		1776.	N.B.—50 pls. of Th. III. were published before 13 July 1776 (G. g. A. 1776, Zug. p. ccxxiv). From internal evidence of Erxleben's Syst. Reg. Anim. 1777.
	17,	,, 290–312,	,, 83 B, 115–116 A, B–118, 120, 121.			
	18,	,, 313–328,	,, 122–126 A, B, 129, 130.			
	19,	,, 329–344,	,, 119, 127, 128, 131–135.			
	20,	,, 345–352,	,, 5 B, 42 A, 91 B, 137 A, B, 138.			
	21,	,, 353–376,	,, 92 B, 139–145.			

[1] According to Goldfuss's circular, Heft 12 terminated Th. II., but this is contrary to all other evidence.

[The last page of Schreber quoted by Erxleben in his Syst. Reg. Anim. 1777, is 376: now Erxleben dated his preface "Goettingæ mense Novembri, 1776;" therefore it is reasonable to suppose that pp. 281–376 of Schreber's work were published before Nov. 1776; the first reference to Erxleben's work by Schreber occurs on p. 455 (*i. e.* in 1777).]

	Heft	pp.	pls.	Year	Reviews
	22,	pp. 377–392,	pls. 146 A, B–152.	1777.	N.B.—Pls. 153–165 were issued in 1777 (G. g. A., 1777, Zug. p. 496).
	23,	,, 393–408,	,, 153–156, 158–161.		
	24,	,, 409–424,	,, 19 A, 93 B, 107 Aa, 136, 162–165.		
	25,	,, 425–440,	,, 104 B, 109 B, 110 B, 115 B, 125 B, 127 B, 157, 45*.		
	26,	,, 441–456,	,, 166–173.		G. g. A., 27 June 1778, p. 623.
	Nachtrag zum 26 Hefte, tab. 60. Bog. Nnn–Eeee (pp. 457–584).				

[Note.—Parts I.–III. were bought by the Berlin Ges. Nat. Freunde (Besch. iii., 1777, p. 530) for their library, and referred to as 1775–1777.]

	Heft	pp.	pls.	Year	Reviews
Th. **IV**.,	**27**,	pp. 591–606,	pls. 142 B, 144*, 161 B, 165*, 171 B, 174–176.	1778.	G. g. A., 16 Dec. 1779, p. 1222; Allg. d. B. xliii. 1780.
	28,	,, 607–622,	,, 178–183, 188, 190.	1779.	
	29,	,, 623–630,	,, 177, 183[?]–187, 193, 194.	1779.	Allg. d. B. *ibid.*
	30,	,, 627[?]–650,	,, 189, 191, 192, 195 A, B–198 A.	1780.	G. g. A., 24 Feb. 1781, p. 191; Allg. d. B. xliii. 1780.
	31, 32,	,, 651–682,	,, 190 B, 198 B–211 A, B.		
	33, 34,	,, 683–690,	,, 58 B, 62 B, 159 B, C, D, 212–222.	1781.	Allg. d. B. xlix. 1782, p. 424.
	35,	,, 691–730,	,, 204 B, 224, 225 A, B–229.	1782.	G. g. A., 17 Oct. 1782, p. 1024.
	36,	,, 731–738,	,, 230–232, 234, 235 B, 236 C, 237, 238. [pls. 230–234, 235 B, C, 237; acc. to G. g. A.]	1782.	G. g. A., 3 May 1783, p. 728; Allg. d. B. lxiv. 1785, p. 132.
[1]	**37, 38**,	,, [none],	,, 135 B, 170 B, 223, 233 A, B, 236 A, C, 239, 240, 242, 243, 245, 246 A, B, 247 B, 248 A.	1783.	G. g. A., 29 Jan. 1785, p. 159; Comm. (Lipsiæ), xxix. 1787, p. 745.
	39,	,, 739–746,	,, 236 B, 247 C, 248 B, C, D, 249 A, B, 252 A.	1784.	Allg. d. B. lxiv. 1785, p. 132.
	40, 41,	,, 747–770,	,, 217 B, 240 B, 247 D, E, 250, 251, 252 B–258, 273, 278.	1784.	G. g. A., 15 July 1786, p. 1112; Allg. d. B. lxix. 1786, p. 456.
	42,	,, 771–802,	,, 247 A, 259, 264, 265, 269–271, 279.	1785.	
	43,	,, 803–818,	,, 225 C, 260, 262, 263 A, B, 267, 268, 270 B.	1785.	
	44, 45,	,, 819–834,	,, 224 B, 244, 266, 272, 275–277, 280, 281, 281 B–286 B.	1787.	
	46, 47,	,, 835–850,	,, 145*, 287, 287 B–290 A, B, 291, A, B–294 A, B, C–296.	1788.	G. g. A., 23 Jan. 1791, p. 1008.
[2]	**48, 49**,	,, 851–866,	,, 128*, 234 B, 297–299 A, B, 300 A, B–302 A, B–307.	1789.	Comm. (Lipsiæ), xxxiii. 1791, p. 379.
	50, 51,	,, 867–882,	,, 309–324.	1790.	G. g. A., 26 May, 1792, p. 847; Comm. (Lipsiæ), xxxiv. 1792, p. 566.
[3]	**52**,	,, 883–898,	,, 308, 315 B, 325–328.	1791.	
[4]	**53, 54**,	,, 899–936,	,, 240 C, 330, 332–337 A, B–347.	1792.	Comm. (Lipsiæ), xxxv. 1793, p. 693.
	55,	,, [none],	,, 235 A, 241, 242 B 247 F, G, 329, 336 B, 338 B.		

Goldfuss, in his circular, terminates Th. IV. here! [2] Th. V. here!! [3] Th. VI. here!!! [4] Th. VII. here!!!!

Th.	Heft	pp.	pls.	Date	Reference
Th. **V.** (pt. 1)	Heft. **56, 57,**	pp. 937–968,	pls. 1 B, C, 2 Suppl., 2 C, 3 B, 4 B, 8 B, C, D, 10 B, C, D, 11 B, 13 B, 14 C, 59 B.		G. g. A., 26 Jan. 1800, p. 1015.
	58, 59,	„ 969–1000,	„ 15 B, 22 C, 25 B, C, 27 B, 38 C, D, 42 A, 112 B, 114 B, 117 B, 213 B, 245 B, 246 A, 307 B, C.		
	60, 61,	„ 1001–1008,	„ 1 C*, 31 B, 38 E*, 64*, 96 B, 121*, 158*, 222 B, 246 C, D, 256 B, 257 A, 261.		
	62,	„ 1009–1048,	„ 11*, 14 B, 18*, 23 B, 66*, 101 B, C, 294 D.	**1804.**	"Cujus Operis lxii sectiones Erlangæ 1774–1804 ... prodierunt." Nova Acta Acad. C. L.-C., ix. 1818, p. 11.
	63,	„ 1049–1064,	„ 6 B, 15*, 26 B, 38 B, 91 A, 105 B, 141*, 141 B.		
	64,	„ 1065–1112,	„ 11 C, 19 C, 39 C, D, 40 C, D, 248 E, 307 D.	[1810.]	

[Schreber's work ended at p. 1112 (sign. *c,ccc,ccc*), he died 10 Dec. 1811; Goldfuss now continued the "Säugthiere."]

Th.	Heft	pp.	pls.	Date	Reference
	65,	pp. 1113–1160,	pls. 1 C**, 152 Ba, 155 Aa, 182 B, 254 Ba, 255*.	**1817.**	Isis, (1) 1818, p. 199.
	66,				
	67,				
	68,				
	69,	„ 1241–1272,	„ 63, 247 H, 287 C, 288 B, 325 A, B.	**1824.**	Isis, (4) 1825, p. 485.

[Goldfuss's work ended here (see Wagner's Preface to Th. V., 2 März, 1836) and "so blieb es bis zum Jahre 1833" (Preface Th. VII.).]

N.B.—I have not been able to trace pp. 1273–1416; see below (Hefte 81 & 82) and onwards for completion of Th. V.

Th.	Heft	pp.	pls.	Date	Reference
Th. **VI.**,	Heft **70,**	pp. 1–48,	pls. 6 C, 10*, 33 B, 87 A, 101 A, 156 A, 210 C, 326 A.	**1834.**	Isis, (4) 1834, p. 383.
	71,	„ 49–96,	„ 25 E, 35*, 125 C, 149 A, 258 B, 260 C, 307 E, 317 F, 319 A.	**1834.**	Isis, (9) 1834, p. 881.
	72, 73,	„ 97–288,	„ 25 D, 30 A, 103 A, 141 B*, 141 C, 142 C, 143 A, 215*, 217 C, 233 D.	**1834.**	Isis, (10) 1834, p. 971.
	74, **75,**			**1834.**	See N.B.
	76, 77, 78	„ 385–480,	„ 5*, 69 A, 85 A, 92 A, 97 C, 113 A, 116 C, 125 Cc, 125 D, 133 A, 141 D, Dd, E, 143 B, 144 C, 155 B, 168 A, 213 C, 224 C, 233 F, 250 A, 265 A, 266 A, 270 A, 325 B, 331.	**1835.**	Isis, (7) 1835, p. 586.
	79,			**1835.**	(*cf.* Isis, (6) 1844), p. 452).
	80,	„ –520,		**1835.**	See N.B.

N.B.—The preface to Th. VI. is dated 12 Dezember 1834; the first 6 Hefte of Th. VI. appeared in 1834; and by Easter 1835 the text was completed (Wiegmann's Arch. Naturg. (2) 1835, p. 320).

Th. **V.** (pt. 1)	Heft. **81, 82**,	pp. 1417–1464,	pls. 31 C, 107 C, 16 D, 245 C, 279*, 281 C, CC, 287 G, 295 A, B, 297 A, B, C, D, 298 A.	**1836.**	Isis, (1) 1837, p. 69.
		,, 1465–1472,	merely description of plates (completion).		
Th. **V.** (pt. 2)	Heft. **83, 84**,	,, 1473–1632,	,, 32 B, 116 E, EE, 116 F, 121 A, 155 Ac, 172 A, B, 287 A, F, 307 A.	**1836.**	Isis, (2) 1837, p. 115.
	85, 86,	,, 1633–1720,	,, 210 A, B, D, E, 214 A, B, 227 A, 231 B.	**1837.**	Isis, (10) 1837, p. 748.
	87, 88,	,, 1721–1824,	,, 6 CC, 172 C, 180 A*, 191 A, 239 A, 248 F, 306 A.	**1837.**	Isis, (11) 1837, p. 828.
	89,	,, 1825–1840,		**1837.**	Isis, (6) 1844, p. 453.
Th. **VII.**, see later on, after Supplement V.					
Suppl. **I.**,	Heft. **90, 91**, **92**, **93**, **94**,			**1839** (1 June).	Wiegm. Arch. vii. (2) 1841, p. 15. "Die Affen sind in den Hften 90–94 enthalten, von welchen das letzte am 1 Oktober 1839 publizirt wurde," Wiegm. Arch. vii. (2) 1841, p. 12.
	95, **96**,			[**1839**.]	
	97, 98,			**1839.**	Wiegm. Arch. vii. (2) 1841, p. 2.

[The complete vol. was issued in 1840 (Isis, (6) 1844, p. 453.]

Suppl. **II.**,	Heft. **99, 100**,	**1840.**	Wiegm. Arch. vii. (2) 1841, p. 2.
	101,		
	102,		
	103,		
	104,		
	105,		
	106,		
	107,		
	108,		

[Suppl. II. was finished in 1841 (Wiegm. Arch. viii. (2) 1842, p. 1.]

Suppl. **III.**,	Heft **109**,
	110,
	111,
	112,
	113,
	114,

Suppl. **IV.**, Heft **115,**
116,
117,
118,

["Der Anfang der 3ten Abth." appeared in 1841 (Wiegm. Arch. viii. (2) 1842, p. 1); "Seit dem Ablaufe des vorigen Jahres (1842) ist von Schreber's Säugthieren . . . die 3te Abth. des Supplementbandes ihrer Beendigung zugeführt worden" (Wiegm. Arch. ix. (2) 1843, p. 2); the Abth. III. was finished in 1843 (Wiegm. Arch. x. (2) 1844, p. 133).]

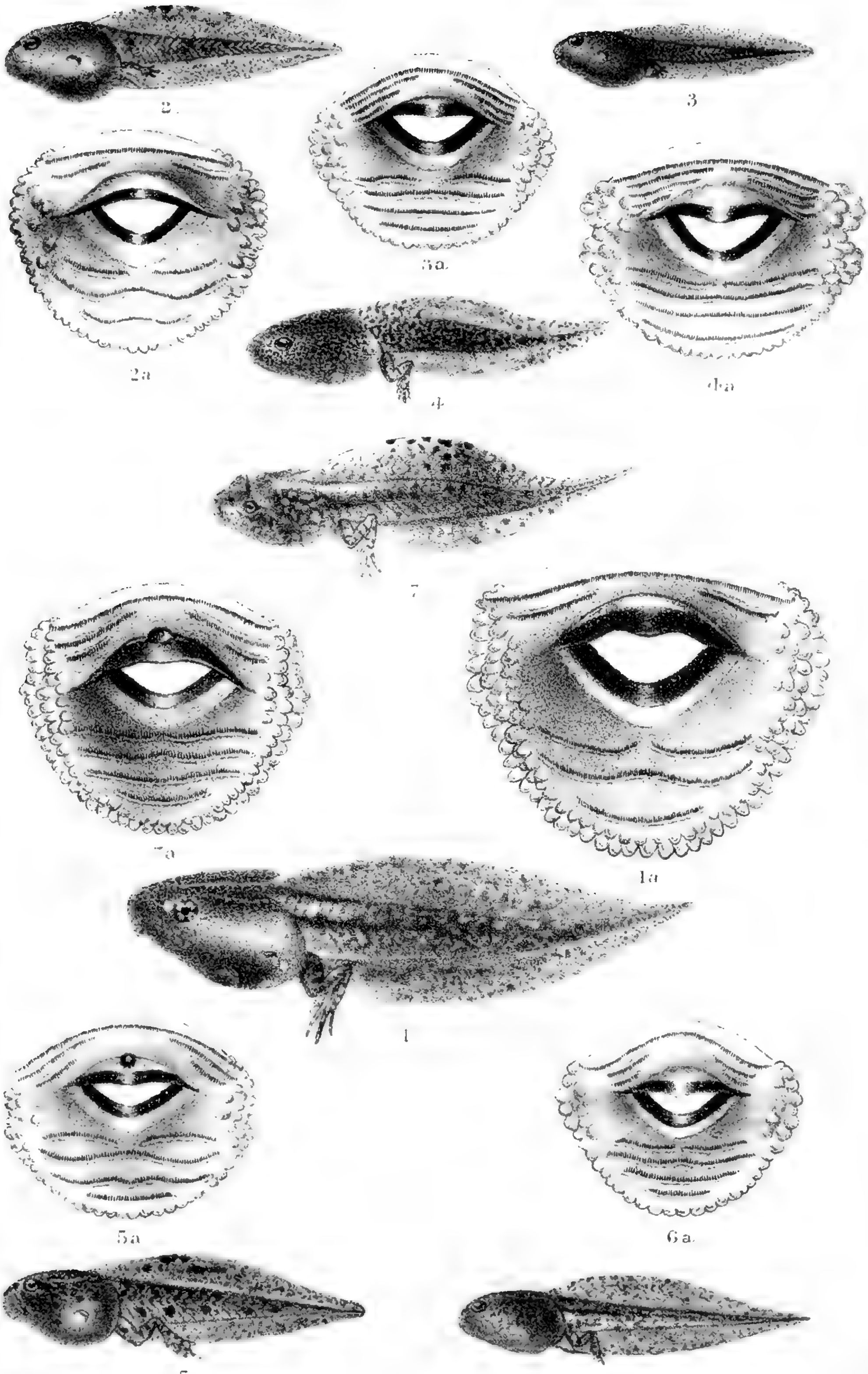
Suppl. **IV.**, Heft. **119–129.** All finished in 1844; Wiegm. Arch. xi. (2) 1845, p. 3.

Suppl. **V.**, Heft. **130, 131,** pp. 1–32, pls. 1–4. **1846.** Engelmann, Bibl. 1846, p. 642.
132,
133,
134,
135,
136,
137,
138,
139,
140,
141,
142,
143,
144,
145,
146.

[Six Hefte appeared in 1854, and the volume was completed in 1855 (Wiegm. Arch. xxii. (2) 1856, p. 34.]

Th. **VII.**, pp. 1–427, pls. 329–385. [By Wiegmann, see Wagner's Prefaces to Th. V. (1 & 2), and Stannius (Preface to Th. VII.), and finally by Wagner himself (*ibid.*).]

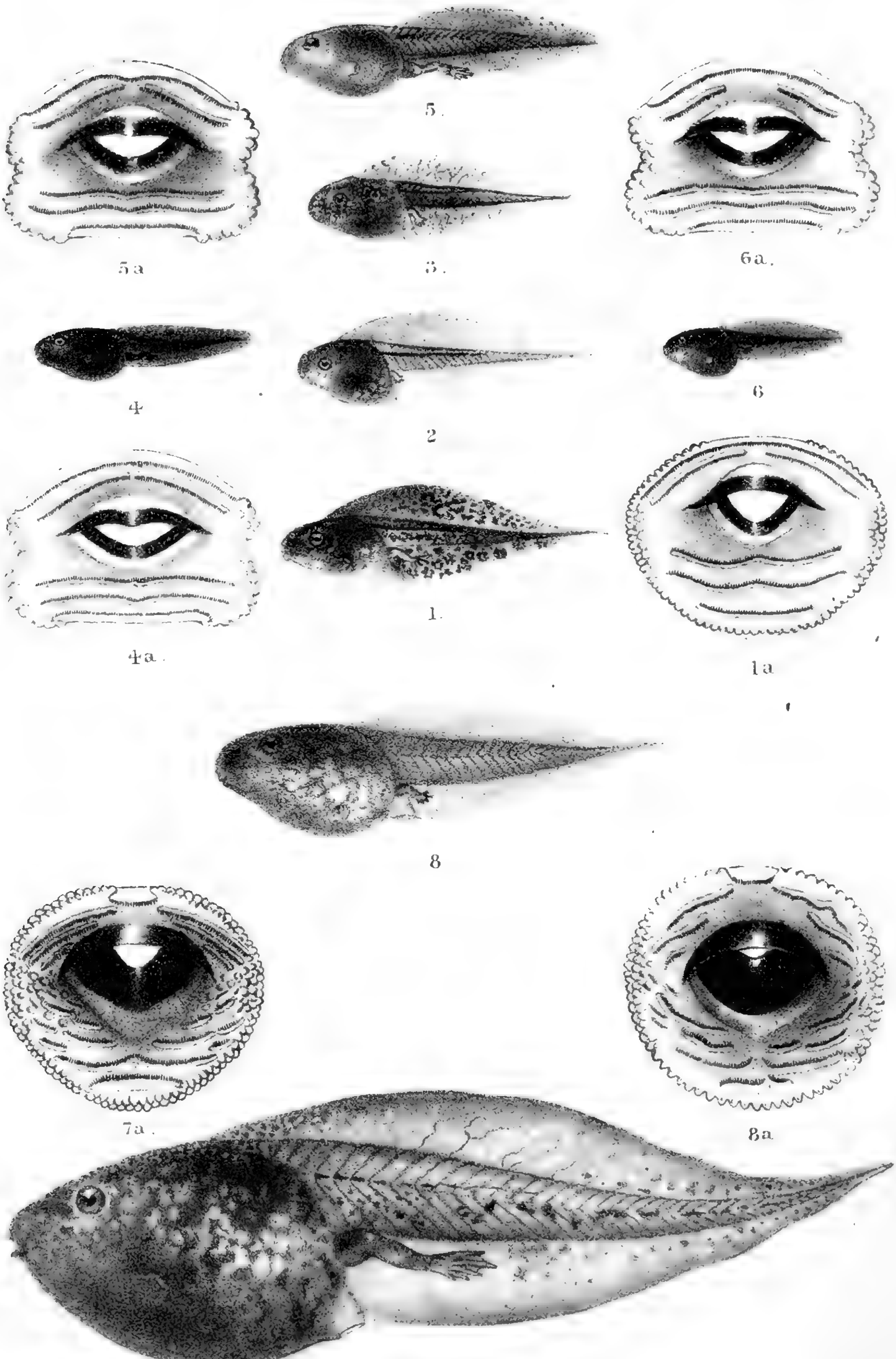
N.B.—After the publication of Heft 129 (*i. e.* in 1844), which completed the IV. Supplement Volume, Wagner began the VII. Volume, containing Pinnipedia and Cetacea; this volume was completed in 1846 (Wiegm. Arch. xiii. (2) 1847, p. 1); Stannius's portion had not appeared in 1845 (certainly), see Engelmann, Bibl. 1846, p. 365.



Peter Smit del et lith.

Mintern Bros. imp.

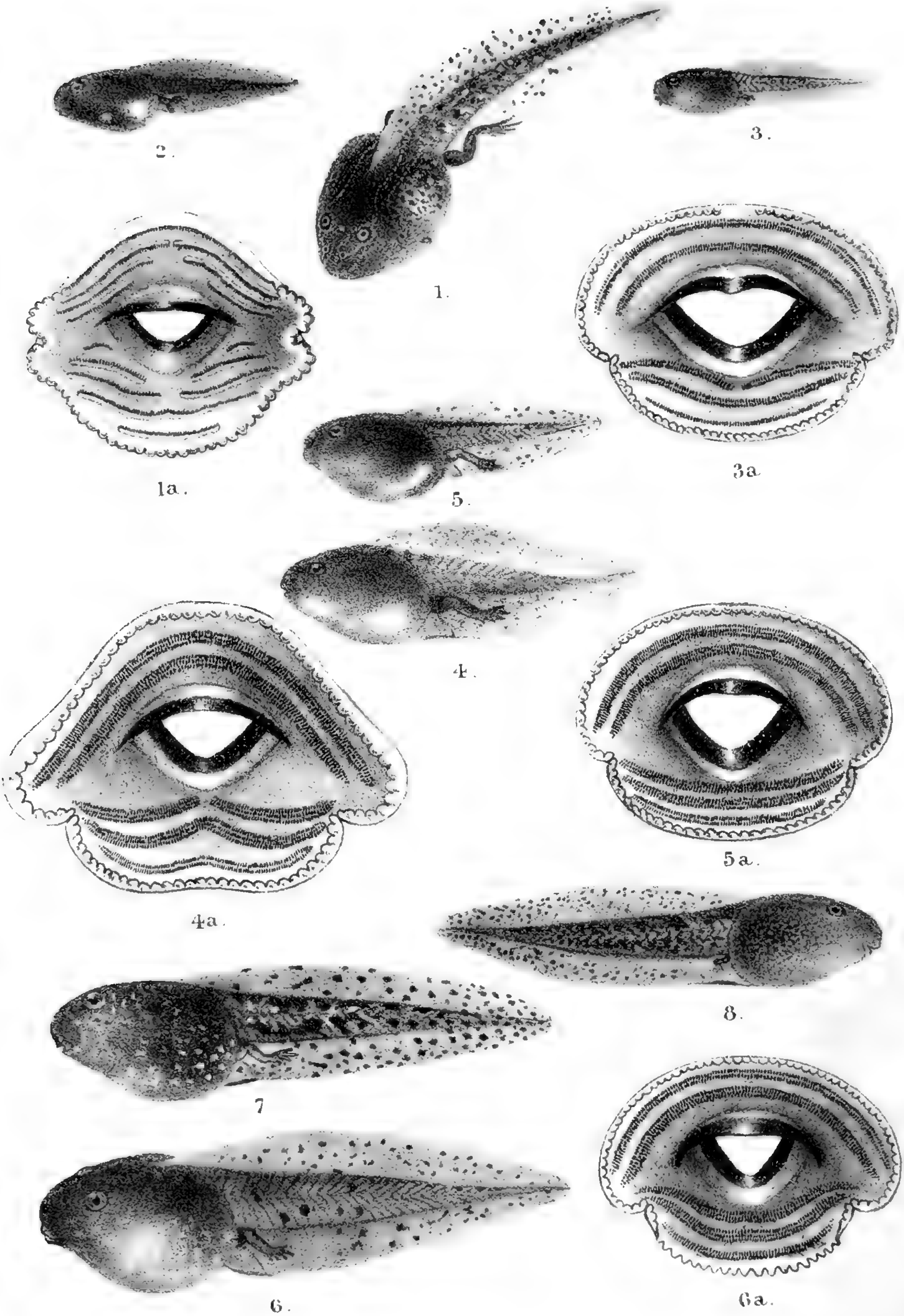
EUROPEAN TADPOLES.
(RANA)



Peter Smit del et lith.

Mintern Bros. imp.

EUROPEAN TADPOLES.
(HYLA, BUFO, PELOBATES)



Peter Smit del. et lith.

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EUROPEAN TADPOLES.
(PELODYTES, DISCOGLOSSUS, BOMBINATOR, ALYTES.)

7. A Synopsis of the Tadpoles of the European Batrachians. By G. A. Boulenger.

(Plates XLV.–XLVII.)

[Received October 28, 1891.]

The knowledge of the larval forms of Tailless Batrachians is of no small importance to the exploring herpetologist. The presence or abundance of many a species which, from concealing or nocturnal habits, is likely to escape detection may be readily ascertained through the recognition of the tadpole. To mention a well-known example, the Midwife Toad, *Alytes obstetricans*, so common in many parts of the Continent, but so seldom met with in the daytime, betrays its existence, through its tadpole, all the year round, the breeding-time lasting throughout spring and summer, so that the tadpoles of the later broods pass the winter in that condition. The presence in a locality of any given Batrachian thus ascertained, it becomes comparatively easy, through searching under stones or in holes in the daytime, or by going about at night with a lantern, to secure specimens of the adult. Tadpoles are, as a rule, easily seen and easily caught, but the identification of the species is often a matter of difficulty. Although excellent contributions to their study have quite recently been published by Héron Royer and Van Bambeke, and by J. de Bedriaga, the absence of a concise synoptic treatment of the subject, accompanied by figures of all the European species, must have deterred many collectors from devoting to the subject the attention it deserves. During several weeks' vacation spent this summer in Brittany, I availed myself of my leisure for collecting and comparing large series of tadpoles of various species, and by incorporating the results of the researches of the above-named and other authors with my own, I have endeavoured, in the following pages, to supply the long-felt desideratum.

My object being to facilitate the determination of species on the spot, I have left out of consideration all such characters as cannot be verified by the aid of an ordinary lens. For the important characters afforded by the microscopical structure of the labial teeth, I refer the reader to the recent works of F. E. Schulze ("Ueber das Epithel der Lippen, der Mund-, Rachen- und Kiemenhöhle erwachsener Larven von *Pelobates fuscus*," Abh. Akad. Berl. 1888), H. Keiffer ("Recherches sur la structure et le développement des dents et du bec cornés chez *Alytes obstetricans*," Arch. de Biol. ix. 1888, p. 55), Héron Royer and Van Bambeke ("Le Vestibule de la bouche chez les têtards des Batraciens anoures d'Europe," Arch. de Biol. ix. 1889, p. 185), and E. Gutzeit ("Die Hornzähne der Batrachierlarven," Zeitschr. wiss. Zool. xlix. 1889, p. 43). The development of the larvæ is also left out of consideration; my descriptions apply merely to the fully-developed tadpole, in the condition generally known as the "third period" in the larval development, the period between the budding of the hind limbs and the bursting out of the fore limbs.

To render my synopsis perfectly intelligible, it is, however, necessary to say a few words, by way of introduction, concerning the external structure of the Tadpole and the manner in which its characters are described.

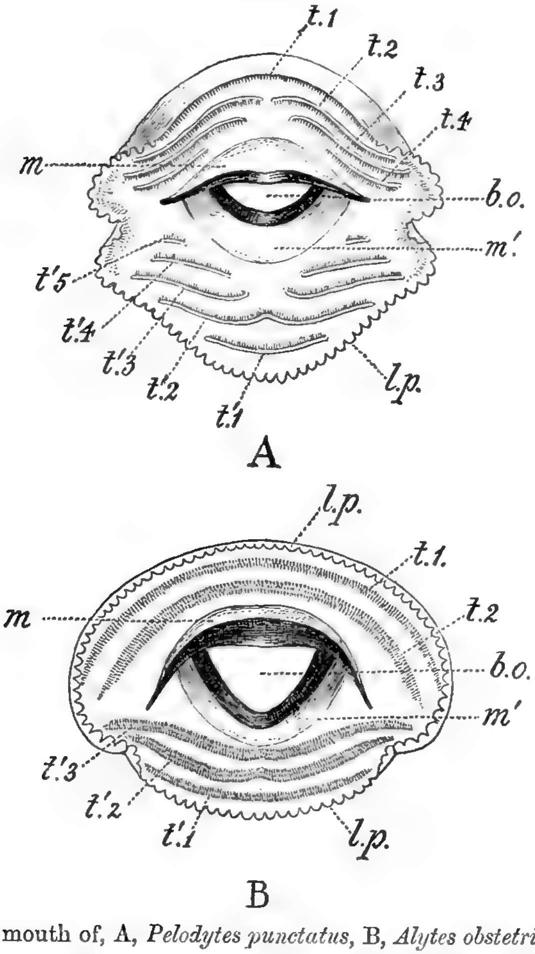
1. *The Form.*—The head and body are so fused that it is extremely difficult to discern the limit between the two. The term *body* is therefore used as meaning both head and body. Its longitudinal measurement is taken to the origin of the hind limbs. The *tail* consists of a fleshy muscular portion bordered above and below by membranous expansions, termed respectively the *upper* and *lower crest*. By depth of the tail is meant its greatest depth, crests included, and the length is measured from the posterior extremity of the body.

2. *The Mouth.*—This term is used in its wider sense, *i. e.* to include the much-developed *lip*, surrounding, like a funnel directed downwards, the *horny beak* (fig. 1, *m.*), not unlike that of a cuttlefish, which forms the entrance to the mouth proper (*b.o.*). The characters offered by this circular lip are among the most important for the distinction of species, and have formed the subject of a valuable paper by Héron Royer and Van Bambeke (Arch. de Biol. ix. 1889), to which I have already referred and shall often have to refer again. This lip may be entirely bordered by fleshy *papillæ* (*l.p.*), or these may be restricted to the sides or to the sides and the lower border. Its inner surface is furnished with ridges armed with series of minute, bristle-like, erect horny *teeth* (fig. 1, *t.*), each of which, when strongly magnified, is seen to be formed of a column of superposed cones, hollowed out at the base and capping each other; the summit of each of these cones is expanded, spatulate, hooked backwards, and usually multicuspid. By drawing an imaginary line across between the mandibles, the lip may be divided into an upper and a lower portion, the series of teeth above the upper mandible being termed *upper labial*, those below the lower mandible being *lower labial*. These are described as 1st, 2nd, 3rd, &c., proceeding from the outer border towards the beak in both the upper and the lower lip, as shown in the accompanying figures. Each series is reckoned as one, whether continuous or more or less interrupted in the middle. This method of describing appears to me far more simple, and at the same time more correct, considering the great amount of individual variation, than that used by the authors named above, who distinguish between "median" and "lateral" series according as to whether or not the series is broken up in the middle. The first series, either in the upper or lower division of the lip, may be marginal (fig. 1, A, *t.*1), or it may be within the border, which is then occupied by fleshy papillæ (fig. 1, B). I have expressed the arrangement of the series of teeth by formulæ—$\frac{2}{3}$, for instance, indicating the number in the upper and lower divisions of the lip, the figures being separated by a transverse line corresponding to the position of the horny beak. The labial teeth are usually arranged in a single row on each ridge (fig. 1, A); in the

Discoglossidæ, however, each ridge, or at any rate the second, bears two or even three rows of teeth (fig. 1, B).

The history of the accessions to our knowledge of the structure of the beak and lips has been given very fully by Héron Royer and Van Bambeke. In addition to the works of Schulze, Keiffer, and

Fig. 1.



Open mouth of, A, *Pelodytes punctatus*, B, *Alytes obstetricans*.
b.o, buccal orifice ; *l.p*, labial papillæ ; *m*, mandibles ; *t*, series of labial teeth.

Gutzeit, mentioned above, I would refer the reader particularly to the following papers :—

C. Van Bambeke. "Recherches sur la structure de la bouche chez les têtards des Batraciens anoures." Bull. Ac. Belg. (2) xvi. 1863, p. 339, pls. i., ii.

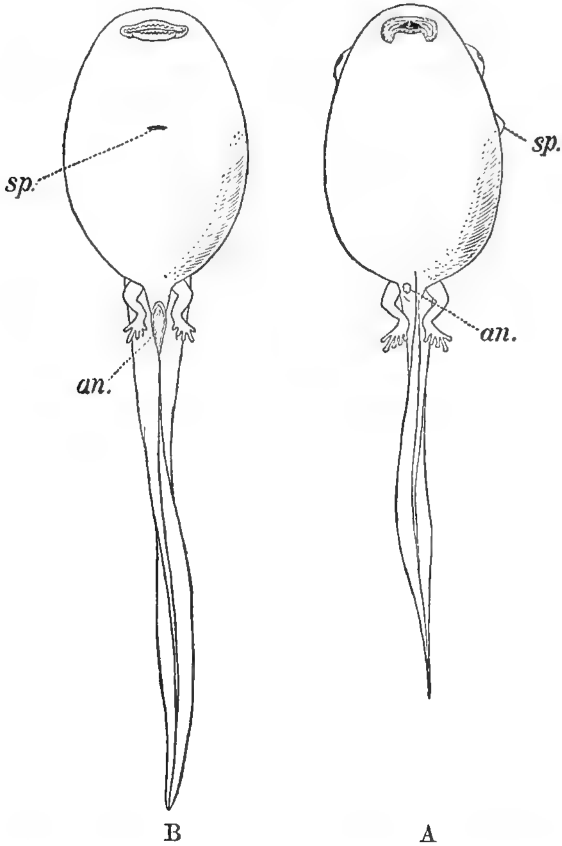
F. E. Schulze. "Ueber Cuticulare Bildungen und Verhornung von Epithelzellen bei den Wirbelthieren." Arch. f. mikr. Anat. v. 1869, p. 295, pl. xvii.

Héron Royer and C. Van Bambeke. "Sur les Caractères fournis par la bouche des têtards des Batraciens anoures d'Europe." Bull. Soc. Zool. France, 1881, p. 75.

M. H. Hinckley. "On some differences in the Mouth Structure of Tadpoles." Proc. Boston Soc. xxi. 1882, p. 307, pl. v.

3. *The Spiraculum.*—After the disappearance of the external gills, the water is expelled from the branchial chambers by one or two tubes opening by one orifice in all European Batrachians[1]. In the

Fig. 2.



Lower view of Tadpoles of, A, *Hyla arborea*, B, *Alytes obstetricans.*

Discoglossidæ two tubes are present, which converge towards the mid-ventral line, where they discharge through one transverse, slit-like or crescentic opening situated in the middle of the breast (fig. 2, B, *sp.*). In all other tailless Batrachians the tube is single and opens on the left side, straight backwards in *Bufo*, backwards and upwards in the other genera (fig. 2, A, *sp.*, fig. 3, A, B). The first discovery of the median spiraculum appears to be due to Pontallié (Ann. Sc. Nat. 3, xviii. 1852, p. 250), and to Lataste

[1] There are two openings, one on each side, in the *Aglossa.*

(Actes Soc. Linn. Bord. xxxi. 1876, p. 95, and Rev. Intern. Sc. ii. 1878, p. 488) belongs the credit of realizing its full systematic importance. We are indebted to Goette (Entwick. d. Unke, p. 676, pl. xviii., 1875) and to Héron Royer (Bull. Soc. Zool. France, 1887, p. 645), who watched the process of its formation, for a correct understanding of its structure.

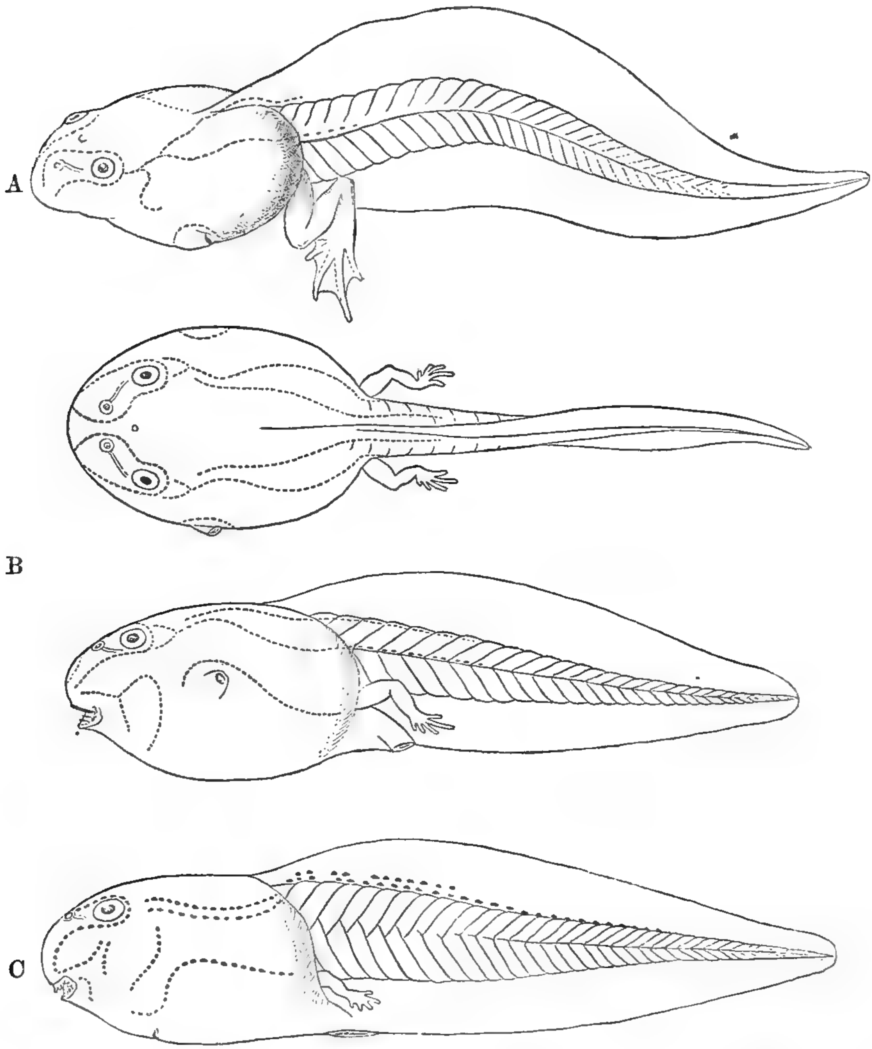
4. *The Anus.*—The anal tube is median, and opens on the middle line of the tail in tadpoles of most Batrachians (fig. 2, B, *an.*). In *Rana* and *Hyla* (fig. 2, A, *an.*), however, it is twisted to the right, opening in the former genus close to the lower edge of the lower caudal crest, higher up on the right side of the crest in the latter. It is not long since that this difference in the position of the anus was first observed. Goette (Entwick. d. Unke, p. 677, 1875) fancied that the dextral anus constantly accompanies the sinistral spiraculum, and his error has recently been repeated by Spengel (Zool. Anz. 1888, p. 339). But I showed in 1884 (Ann. & Mag. N. H. xiv. p. 390), and again in 1886 (Bull. Soc. Zool. France, 1886, p. 319), that such a correlation exists only in the genera *Rana* and *Hyla*, the Toads and Pelobatoids having the median anus together with the sinistral spiraculum.

5. *The Lines of Muciferous Crypts.*—All tadpoles are provided with these organs, the homologues of the lateral line in fishes. Their existence, long overlooked, and their signification as organs of a special sense, were first pointed out by F. E. Schulze (Arch. f. Anat. u. Phys. 1861, p. 767), whose researches into their structure were supplemented by himself (Arch. f. mikr. Anat. vi. 1870, p. 62), Leydig (N. Acta Ac. Leop.-Carol. xxxiv. 1868, p. 46), and Malbranc (Zeitschr. f. wiss. Zool. xxvi. 1875, p. 24). For further notes on the disposition of these lines we are indebted to Lessona (Atti Acc. Lincei, 3, i. 1877) and Lataste (Actes Soc. Linn. Bord. xxxii. 1879, p. 308). The latter author, however, overrated the systematic importance which is to be attached to these organs. It is a fact that they may differ greatly as regards their degree of development in individuals of the same species, and their arrangement also varies, within certain limits, irrespective of the species. I have found them usually most distinct in *Pelodytes*, *Rana agilis*, *R. latastii*, and *Bombinator igneus*, least in *Bufo*. The most distinct and constant appear to be the lines situated on the head, passing between the nostrils and bordering the eyes. I append figures (fig. 3, p. 598) of tadpoles of *Rana agilis*, *Pelodytes punctatus*, and *Alytes obstetricans*, in which these organs are represented by dotted lines. In addition to these lines all tadpoles show more or less distinctly a small whitish gland in the middle of the head between the eyes, the so-called *frontal gland* (Stieda, Arch. f. Anat. u. Phys. 1865, p. 52; Lessona, Atti Acc. Tor. v. 1880, p. 581; H. de Graaf, Bijdr. tot de Kenn. v. d. Bouw e. d. Ontwikk. d. Epiphyse b. Rept. e. Amph., Leyden, 1886), and a glandular streak, extending from the nostril towards the eye, the *lachrymal gland* (Born, Morph. Jahrb. ii. 1876, p. 611, figs. 23 & 24).

6. *Pigmentary Network.*—In addition to the ordinary pigment-

cells, the tadpoles of a few genera (*Discoglossus*, *Bombinator*, *Pelodytes*) present a system of fine black lines, most apparent on the caudal crests and the more feebly pigmented parts of the body, which afford excellent characters for their identification. It is a fact worthy of notice that when the end of the tail has been nibbled off,

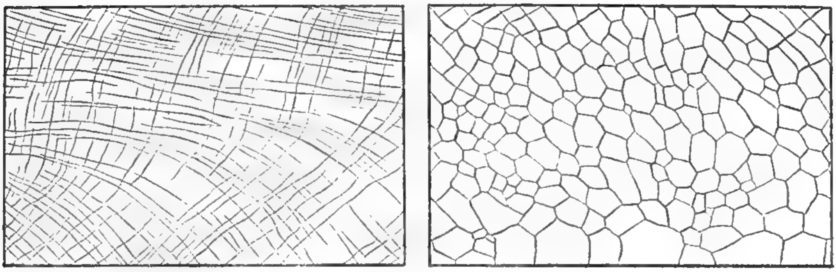
Fig. 3.



A. *Rana agilis.* B. *Pelodytes punctatus.* C. *Alytes obstetricans.*

these pigmentary lines are not reproduced on the regenerated portion. These lines were first noticed in *Bombinator* by Leydig (N. Acta Ac. Leop.-Carol. xxxiv. 1868, p. 105, pl. ii. fig. xix.), in *Discoglossus* by Lataste (Actes Soc. Linn. Bord. xxxiii. 1879, p. 304, pl. v. fig. 7), and in *Pelodytes* by Bedriaga (Bull. Soc. Nat. Mosc. 1889, p. 541). Their aspect is shown in the following figures, representing much-enlarged pieces of the upper caudal crest of *Pelodytes* and *Discoglossus*.

Fig. 4.



A B

Much enlarged pieces of upper caudal crest of, A, *Pelodytes punctatus*, B, *Discoglossus pictus*.

Preservation and Manipulation.—Tadpoles should be preserved in alcohol. Chromic acid is not to be recommended, as rendering the specimens too brittle for ordinary study. To ensure the good condition of specimens preserved in spirit, it is necessary to treat them with a little care; tadpoles thrown into the ordinary collecting-bottle promiscuously with other specimens are never in a satisfactory condition for display in a collection and for future study. The best plan is to provide one's self, when going out collecting, with small test-tubes half-full of weak spirit; the tadpoles, when taken out of the fishing-net, should be dipped head foremost in the tube, which may be filled with as many specimens as it will hold. On reaching home, say two or three hours later, the liquor should be at once changed to strong spirit (40°), which will again require changing the next day, and so on until it ceases to be strongly coloured. By this method, of killing in weak spirit and then seizing by strong spirit, the tadpole preserves its natural shape in a remarkably perfect manner, and the delicate caudal crests do not shrivel. Specimens which have been only a few hours in spirit are in the best condition for study; a slight pressure of the fingers on the back and breast causes the beak and lip to gape fully, showing the arrangement of the labial papillæ and teeth. When studying specimens which have been a long time preserved, it is best to soak them for a few minutes in water, which, penetrating the subcutaneous vacuities, swells them out and restores their life-appearance. Tadpoles should never be allowed to remain out of the liquid, as they very rapidly shrink, especially the caudal crests. The lines of muciferous crypts are sometimes very difficult to trace. Héron Royer (Bull. Soc. Et.

Sc. Angers, (2) xv. 1885, p. 107) suggests as a method of ascertaining their disposition, in cases when specimens can be sacrificed, to strip the skin and spread it out on the convex surface of the bottom of a test-tube, chosen to suit the size of the tadpole; the transparent skin may then be easily studied.

G. Born (Arch. f. mikr. Anat. xxvii. 1886, p. 207) recommends a method of studying and handling the larvæ in their fresh condition, by paralyzing them through immersion in a solution of tobacco, as was proposed by Lataste for fixing the adult *in copulâ*. The little creatures become insensible after a few minutes, and remain so for about half an hour after being transferred to pure water; they recover perfectly if the immersion in the solution has not been too prolonged.

As stated above, the object of this paper is to supply comparative descriptions of the external characters of the Tadpoles of Europe, so as to facilitate the identification of the species. But in order to enable the reader to acquaint himself with the rather extensive special bibliography, I have introduced copious references to the authors who have previously dealt with the subject. I have also briefly indicated the habitat and breeding-season of each species.

In addition to the extensive material collected by myself, I have been able to study many specimens received from M. Héron Royer, M. E. Boscá, Dr. J. de Bedriaga, Prof. Born, Prof. Lütken, Dr. W. Wolterstorff, Prof. Giglioli, Dr. L. Joubin, and Prof. Camerano, to all of whom I beg to tender my sincere thanks.

The tailless Batrachians are represented in Europe by 19 species, belonging to 8 genera and 5 families:—

I. RANIDÆ.

1. RANA, L., 1766.

1. *esculenta*, L., 1766.
2. *arvalis*, Nilss., 1842.
3. *temporaria*, L., 1766.
4. *græca*, Blgr., 1891.
5. *iberica*, Blgr., 1879.
6. *latastii*, Blgr., 1879.
7. *agilis*, Thom., 1855.

II. HYLIDÆ.

2. HYLA, Laur., 1768.

8. *arborea*, L., 1766.

III. BUFONIDÆ.

3. BUFO, Laur., 1768.

9. *vulgaris*, Laur., 1768.
10. *viridis*, Laur., 1768.
11. *calamita*, Laur., 1768.

IV. PELOBATIDÆ.

4. PELOBATES, Wagl., 1830.
12. *fuscus*, Laur., 1768.
13. *cultripes*, Cuv., 1829.

5. PELODYTES, Fitz., 1838.
14. *punctatus*, Daud., 1802.

V. DISCOGLOSSIDÆ.

6. DISCOGLOSSUS, Otth, 1837.
15. *pictus*, Otth, 1837.

7. BOMBINATOR, Merr., 1820.
16. *igneus*, Laur., 1768.
17. *pachypus*, Fitz., 1838.

8. ALYTES, Wagl., 1830.
18. *obstetricans*, Laur., 1768.
19. *cisternasii*, Boscá, 1879.

It is with no small satisfaction that I look over this list and compare it with that drawn up by Schreiber ('Herpetologia Europæa') in 1875, in which only 12 species are enumerated, as showing how much progress has been made within the last fifteen years. Through the researches of Fatio, Lataste, Leydig, Héron Royer, Camerano, Pflüger, Born, Bedriaga, and myself, the right to specific rank of the forms allied to *Rana temporaria* that had been distinguished by Nilsson, Steenstrup, and Thomas has been indisputably established; the question of the distinctness of the two species of *Bombinator* has been settled; and four altogether new species have been added.

Key to the Identification of Genera and Species of European Tadpoles.

I. Spiraculum sinistral; labial teeth disposed in a single row in each series or ridge.

A. Anus dextral; spiraculum directed backwards and upwards; lower lip bordered with papillæ.

1. Anus opening close to the lower edge of the tail; upper caudal crest not extending forwards beyond the vertical of the spiraculum; eyes on the upper surface.. I. RANA.

a. Series of labial teeth $\frac{2 \text{ or } 3}{3}$.

Interocular space at least twice the distance between the nostrils, and much greater than the width of the mouth; tail acutely pointed, at least nearly twice as long as the body .... 1. *R. esculenta.*

Interocular space but little wider than the distance between the nostrils or the width of the mouth; tail once and two thirds to twice as long as the body ...... 2. *R. arvalis.*

b. Series of labial teeth $\frac{3 \text{ to } 5}{4}$.

a. Tail obtusely pointed, once and a half to twice as long as the body.

Second series of upper labial teeth widely interrupted in the middle; first series of lower labial teeth at least two thirds the length of the second; width of mouth a little less than the interocular width, which equals about once and a half the distance between the nostrils .... 3. *R. temporaria.*

Second series of upper labial teeth continuous or narrowly interrupted; first series of lower labial teeth at least two thirds the length of the second; width of mouth quite as great as the interocular space, which equals about once and a half the distance between the nostrils.. 4. *R. græca.*

Second series of upper labial teeth widely interrupted in the middle; first series of lower labial teeth hardly half as long as the second; width of mouth much less than the interocular space, which equals nearly twice the distance between the nostrils.......................... 5. *R. iberica.*

β. Tail acutely pointed or submucronate, at least nearly twice as long as the body.

Interocular space once and a half the width of the mouth or the distance between the nostrils; no tubercle on the upper mandible .... 6. *R. latastii.*

Interocular space at least twice the width of the mouth or the distance between the nostrils; usually a black tubercle on the upper mandible .... 7. *R. agilis.*

2. Anus opening above the lower edge of the tail; upper caudal crest extending far forwards on the back, almost to between the eyes, which are lateral and visible from the ventral as well as from the dorsal aspect of the body; series of labial teeth $\frac{2}{3}$ .... II. HYLA.

8. *H. arborea.*

B. Anus median.

1. Spiraculum directed straight backwards; tail rounded at the end; both upper and lower lip with toothed edge; series of labial teeth $\frac{2}{3}$......... III. BUFO.

Mouth at least as wide as the interocular space, which is twice as great as the distance between the nostrils; second upper series of labial teeth very narrowly interrupted in the middle .... 9. *B. vulgaris.*

Mouth nearly as wide as the interocular space, which measures once and a half the distance between the nostrils; second upper series of labial teeth more or less interrupted in the middle .... 10. *B. viridis.*

Mouth considerably narrower than the interocular space, which is nearly twice as great as the distance between the nostrils; second upper series of labial teeth very widely interrupted in the middle.......................... 11. *B. calamita.*

2. Spiraculum directed upwards and backwards; lower lip bordered with papillæ; series of labial teeth $\frac{4}{4}$ or $\frac{5}{5}$.

a. Tail acutely pointed, without black lines; first series of upper labial teeth short; beak entirely black .... IV. PELOBATES.

Tail once and a half to twice as long as the body; interocular space at least twice, often nearly thrice, the distance between the nostrils, and considerably greater than the width of the mouth .... 12. *P. fuscus.*

Tail hardly once and a half the length of the body; interocular space not more than twice as broad as the distance between the nostrils .... 13. *P. cultripes.*

b. Tail obtusely pointed, with fine black decussating lines; an inverted fold on each side of the lip, the upper edge of which bears a long series of teeth; beak white, with black edge............... V. PELODYTES.
14. *P. punctatus.*

II. Spiraculum median; anus median; tail rounded or obtuse at the end; a papillose edge all round the lip, sometimes narrowly interrupted above; labial teeth in $\frac{2}{3}$ series, disposed in two or three rows, at least in the second series.

A. Spiraculum equally distant from the anterior and the posterior extremity of the body; tail at least once and a half the length of the body and three and a half or four times as long as deep; caudal crests with a polygonal network of fine black lines... VI. DISCOGLOSSUS.
15. *D. pictus.*

B. Spiraculum nearer the posterior than the anterior extremity of the body; tail not more than once and a half the length of the body, twice to twice and a half as long as deep; caudal crests with fine black decussating lines .... VII. BOMBINATOR.

Mouth trigonal .... 16. *B. igneus.*
Mouth elliptical... 17. *B. pachypus.*

C. Spiraculum nearer the anterior than the posterior extremity of the body; tail at least once and a half the length of the body, twice and two thirds to thrice and a half as long as deep; no black network. VIII. ALYTES.
18. *A. obstetricans*; 19. *A. cisternasii.*

With regard to size, the European tadpoles rank as follows :—

		Maximum length on record. millim.
1.	*Pelobates fuscus*	175
2.	,, *cultripes*	120
3.	*Rana esculenta*	111
4.	*Alytes obstetricans*	90
5.	,, *cisternasii*	69
6.	*Pelodytes punctatus*	65
7.	*Rana agilis*	59
8.	*Bombinator igneus*	50
9.	*Hyla arborea*	49
10.	*Rana iberica*	49
11.	,, *græca*	48
12.	,, *temporaria*	46
13.	*Bombinator pachypus*	45
14.	*Bufo viridis*	44
15.	*Rana latastii*	44
16.	,, *arvalis*	43
17.	*Discoglossus pictus*	33
18.	*Bufo vulgaris*	32
19.	,, *calamita*	30

But if we compare the maximum length of the tadpole with the maximum length of the adult, we obtain the following order:—

		Maximum length of adult, from snout to vent. millim.
1.	*Pelobates fuscus*	80
2.	*Alytes obstetricans*	50
3.	*Pelobates cultripes*	85
4.	*Alytes cisternasii*	40
5.	*Pelodytes punctatus*	45
6.	*Bombinator igneus*	45
7.	*Rana esculenta*	110
8.	*Hyla arborea*	50
9.	*Bombinator pachypus*	50
10.	*Rana agilis*	75
11.	„ *iberica*	50
12.	„ *græca*	50?
13.	„ *latastii*	65
14.	„ *arvalis*	75
15.	„ *temporaria*	85
16.	*Bufo viridis*	85
17.	*Discoglossus pictus*	70
18.	*Bufo calamita*	80
19.	„ *vulgaris*	150

1. Rana esculenta, L. (Plate XLV. fig. 1.)

Length of body once and a half its width, or rather less, about half the length of the tail. Nostrils a little nearer the eyes than to the end of the snout. Eyes on the upper surface of the body, equidistant from the end of the snout and the spiraculum, or slightly nearer the latter; the distance between the eyes twice to twice and a half as great as that between the nostrils, and much greater than the width of the mouth. Spiraculum on the left side, directed upwards and backwards, a little nearer the end of the snout than to the anus, visible from above and from below. Anus opening on the right side, close to the lower edge of the subcaudal crest. Tail twice and three fourths to four times as long as deep, acutely pointed; upper crest convex, a little deeper than the lower, not extending far upon the back; the depth of the muscular portion, at its base, about half the greatest total depth.

Beak very broadly edged with black, sometimes almost entirely black. Sides and lower edge of the lip bordered with papillæ, which usually stand in two rows; upper lip with a long series of fine teeth, followed, on each side, by a short series; three series of teeth in the lower lip, the two outer uninterrupted, the third also continuous or narrowly interrupted, the outermost only one half to two thirds as long as the others.

The muciferous crypts are pretty distinct on the head, where they form two series, extending from the end of the snout to the upper borders of the eyes, passing between the nostrils; a pair of dorsal lines on each side of the back, close together in front, diverging posteriorly, are usually distinguishable; these lines in the advanced tadpole coalesce to form the dorso-lateral fold of the perfect animal.

Olive or greyish olive above, speckled with brown; sides with silvery or pale golden spots; belly white; throat pinkish, with mother-of-pearl-coloured spots; tail pale greyish, closely spotted, dotted, or vermiculated with grey or blackish; the muscular portion of the tail yellowish, often with three blackish stripes on its basal third. With advancing age, when the hind limbs are approaching to their full development, the back assumes a more decidedly greenish colour, and the pale green vertebral stripe, if it is to exist, makes its appearance.

The largest tadpoles of the typical form which I collected this summer in Brittany measure 77 millim.: body 23, width of body 18; tail 64, depth of tail 20. Tadpoles of the var. *ridibunda*, sent from Prague by Hr. V. Fritsch, measure up to 90 millim. A specimen from the latter locality, 111 millim. long, is recorded by Pflüger (Arch. Ges. Physiol. xxxi. 1883, p. 141).

In addition to the admirable illustrations of Rösel (Hist. Ran. pl. xiv., 1758), this tadpole has been figured by Lataste (Actes Soc. Linn. Bord. xxx. 1876, pl. ix. figs. 4–6) and by Lessona (Atti Acc. Lincei, 3, i. 1877, pl. i. figs. 1, 4, 5), and the mouth by Héron Royer and Van Bambeke (*l. c.* pl. xv. fig. 5).

I am not aware of any differences by which to distinguish in the larval state the various races I have lately endeavoured to diagnose (Proc. Zool. Soc. 1891, p. 374).

With the exception of the extreme north, the Edible Frog inhabits the whole of the Palæarctic region.

The breeding-season falls between the middle of May and the end of June, the transformation of the larvæ taking place normally from the middle of August to the end of September. Hibernating larvæ are, however, not of very unfrequent occurrence. I have more than once found in Belgium full-grown larvæ so early in the year that they must have passed the winter. Well authenticated cases of hibernation have been recorded by Kolazy (Verh. zool.-bot. Ges. Wien, xxi. 1871, pp. 38, 1267), Kessler (Bull. Soc. Nat. Mosc. 1878, p. 207), and Kollmann (Verh. nat. Ges. Basel, vii. 1883, p. 387[1]).

2. Rana arvalis, Nilss. (Plate XLV. fig. 2.)

Although this species is closely allied to *R. temporaria*, it approaches in some respects *R. esculenta*, the spermatozoa, for instance, agreeing very closely with those of the latter species (*cf.* Leydig, An. Batr. Deutsch. Faun. p. 137, pl. v., 1877). The tadpole likewise is

[1] Lataste remarks, however (C. R. Assoc. Franç. xii. 1883, p. 570), that Kollmann has mixed up larvæ of *Pelobates fuscus* and *Rana esculenta* under the latter name. His largest specimen (105 millim. long) is stated to belong to *Pelobates*.

intermediate between those of the two above-named species. In its labial dentition it agrees with *R. esculenta,* the series of teeth being usually $\frac{2}{3}$, sometimes $\frac{3}{3}$ when a third very short series is present on each side of the upper lip. The beak is whitish, narrowly edged with black. Interocular space about once and a half the distance between the nostrils, which equals or slightly exceeds the width of the mouth. Tail pointed, rarely somewhat obtuse, once and two thirds to twice the length of the body, its depth about one third its length; depth of the muscular part not quite half the greatest total depth. Lines of muciferous crypts distinct on the head and body, disposed as in *R. agilis* (see fig. 3, A, p. 598).

Brown above, with metallic spots; caudal crests greyish white, with small brown spots and golden dots on the anterior half of the upper crest; sometimes a series of large brown spots on the upper edge of the tail, or a linear series of small golden spots along the upper and lower crests; belly greyish with golden dots.

The largest of the numerous specimens examined, for which I am indebted to the kindness of Prof. G. Born, M. Héron Royer, and Dr. Wolterstorff, measures 43 millim.: body 16, width of body 10; tail 27, depth of tail 9.

This tadpole has been described by Born (Arch. f. mikr. Anat. xxvii. 1886, p. 207), Héron Royer and Van Bambeke (*l. c.* p. 263, pl. xviii. fig. 1), and Bedriaga (Bull. Soc. Nat. Mosc. 1889, p. 313), but, with the exception of the mouth, has not yet been figured.

R. arvalis is known to inhabit Germany, Holland near Apeldoorn, Switzerland near Basle, Denmark, Sweden, Southern Norway, Russia, Hungary, Transylvania [1], Asia Minor, Western Siberia, the Kirghiz Steppes, and North-western Persia.

In Germany, *R. arvalis* breeds, as a rule, about a fortnight later than *R. temporaria,* and its larvæ transform between the middle of June and the beginning of August.

3. Rana temporaria, L. (Plate XLV. fig. 3.)

Length of body once and a half to once and two thirds its width, two thirds to one half the length of the tail. Nostrils equally distant from the eyes and from the end of the snout or a little nearer the latter. Eyes on the upper surface of the body, a little nearer the end of the snout than to the spiraculum; the distance between the eyes about once and a half the distance between the nostrils, and a little greater than the width of the mouth. Spiraculum directed backwards and slightly upwards, nearly equally distant from the end of the snout and from the anus, visible from above and from below. Anus opening on the right side, close to the lower edge of the subcaudal crest. Tail three to four times as long as deep, ending in an obtuse point; upper crest convex, not or but slightly deeper than the lower, not extending far upon the back; the depth

[1] I am able to add a new European locality to the habitat of this species; a breeding male obtained at Karlovac, Sclavonia, was presented this spring to the British Museum by Hr. V. Fritsch.

of the muscular portion, at its base, about one third the greatest total depth.

Beak broadly edged with black. Sides and lower edge of the lip bordered with papillæ; upper lip with a long series of teeth, followed on each side by two or three series, which are widely separated from their fellows on the other side and gradually decrease in length; four series of teeth in the lower lip, the fourth or inner widely interrupted in the middle, the first or outer at least two thirds the length of the second. Héron Royer (Bull. Ac. Belg. 3, i. 1881, p. 139) regards the specimens with three series of teeth in the upper lip as representing a distinct subspecies (*honnorati*, H. R.), but Born (Arch. f. mikr. Anat. xxvii. 1886, p. 209) and Camerano (Atti Acc. Torin. xxvi. 1890, p. 82) have shown that specimens with three or four series are found promiscuously in Germany and in the Alps. I may add that British specimens have usually only three series of upper labial teeth.

Muciferous crypts very indistinct.

Dark brown to blackish above, with metallic dots; caudal crests greyish, uniform, or dotted or powdered with brown, with or without small golden spots; belly grey to blackish with metallic dots or spots.

The largest specimen from the environs of London measures 37 millim.: body 13, width of body 9; tail 24, depth of tail 7. Camerano (*l. c.*) records specimens 46 millim. long.

Rana temporaria inhabits Central and Northern Europe (where it is still found in abundance as far as the North Cape and Lapland[1]), the Pyrenees, the hills of North-western Spain, and the Italian Alps, Siberia and Yesso.

It breeds, in the plains of Central Europe, from the beginning of February to the beginning of April, and the young leave the water in May or June. In the Alps, where this species is found as high up as 10,000 feet, the metamorphosis may not be completed until late in the summer, and cases of hibernation in the larval condition are frequent (Camerano, Atti Acc. Torin. xix. 1883, p. 86, and Boll. Mus. Torin. 1887, no. 30, and 1889, no. 56).

4. Rana græca, Blgr. (Plate XLV. fig. 4.)

This tadpole, although more nearly resembling that of *R. temporaria* than any other European species, differs from all its congeners in having the mouth quite as wide as the interorbital space, which equals once and a half the distance between the nostrils. The labial dentition is more developed even than in *R. temporaria*, the teeth

[1] A note by Gaimard (Bibl. Univ. 2, xxvi. 1840, p. 207) has been interpreted by some authors as indicating the presence of Frogs in Iceland. Gaimard states that he made experiments in Iceland on the endurance of cold on three Batrachians, viz. *Rana temporaria*, *Bufo vulgaris*, and *Bufo calamita*, but does not actually say that he procured the specimens on that island, although, from the wording of his note, it would be quite natural to infer he did. But neither the list of Iceland animals given by Mohr (Fors. Isl. Naturh., Copenhagen, 1786) nor that published by E. Robert in Gaimard's Voyage (Voy. en Islande et au Groënl., Zool. et Méd., Paris, 1851) contains any allusion to Batrachians.

forming $\frac{5}{4}$ or $\frac{4}{4}$ series, of which the second upper is but narrowly interrupted in the middle; the four lower series are either all continuous and occupying nearly the whole width of the lip, or the fourth is broken up in the middle. A single series of papillæ on the lower labial edge. Tail obtuse, once and two thirds the length of the body, its depth about one third its length.

Grey above, closely speckled with black, whitish beneath; muscular portion of the tail reticulated with black; caudal crests with small black spots or arborescent markings.

Total length 48 millim.: body 18, width of body 12; tail 30, depth of tail 10.

Several tadpoles, from the Parnassos, were received from Dr. Krüper. In recently describing this Frog (Ann. & Mag. N. H. 6, viii. 1891, p. 346, with fig.), I have explained how the study of these larvæ led me to suspect the existence of a new species of *Rana* in the mountains of Greece (Parnassos and Korax).

5. Rana iberica, Blgr. (Plate XLV. fig. 5.)

Like the following, this Frog is intermediate between *R. temporaria* and *R. agilis* in both its perfect and larval state. Width of mouth much less than the interocular space, which equals nearly twice the distance between the nostrils. Series of labial teeth $\frac{3}{4}$, rarely $\frac{4}{4}$, the second upper series widely interrupted in the middle, the third very short; first lower series short, hardly half the length of the second, fourth interrupted in the middle. The beak resembles that of *R. agilis* and, in one of the four specimens before me, the upper mandible is likewise provided with a large black tubercle in the middle of its basal portion.

Tail obtuse, once and a half to once and three fourths the length of the body, its depth about one third its length.

Lines of muciferous crypts very distinct, as in *R. agilis.*

The colour of the upper parts varies from reddish brown (Héron Royer) to blackish brown (Bedriaga); belly greyish or whitish; caudal crests brownish, the upper darker than the lower, with brown dots and large blackish spots, which are also present on the muscular part.

The largest of the two tadpoles from Coimbra, which I owe to the kindness of Dr. de Bedriaga, measures 49 millim.: body 17, width of body 12; tail 32, depth of tail 11.

The tadpole of this species, which inhabits Spain and Portugal, has recently been described by Héron Royer and Van Bambeke (*l. c.* p. 258, pl. xvi. fig. 4) and by Bedriaga (Larves des Batr. de Portug., Coimbra, 1891, p. 8).

According to Boscá (Bull. Soc. Zool. France, 1880, p. 259), *R. iberica* is usually found in or near water. He found small larvæ on the 22nd of March and, on the same day, a breeding male.

6. Rana latastii, Blgr. (Plate XLV. fig. 6.)

Intermediate between *R. temporaria* and *R. agilis.* Width of mouth equalling the distance between the nostrils and two thirds the distance between the eyes. Series of labial teeth $\frac{3}{4}$, the second upper series very widely interrupted in the middle, the third extremely short; first lower series very short, hardly half the length of the second, fourth interrupted in the middle. Beak as in *R. temporaria*. Tail acutely pointed, twice as long as the body, its depth one third its length.

Lines of muciferous crypts very distinct, as in *R. agilis*.

Brown above, whitish beneath; caudal crests whitish, dotted with dark brown, the upper with some larger spots.

Total length 44 millim.: body 14, width of body 10; tail 30, depth of tail 10.

R. latastii inhabits Northern Italy and Tuscany. Its tadpole has not been described before. I am indebted to M. Héron Royer for a single specimen, from which the above notes are taken.

7. Rana agilis, Thomas. (Plate XLV. fig. 7.)

In general form similar to *R. esculenta*, but snout rather shorter, the nostrils being equidistant from the eyes and the end of the snout, and spiraculum considerably nearer the posterior than the anterior extremity of the body. Interocular space twice as great as the distance between the nostrils. Tail twice to twice and a half as long as the body, pointed and attenuate or submucronate at the end, its depth about twice and two thirds in its length; upper crest very convex, deeper than the lower, and extending upon the back as far as the level of the spiraculum.

Beak broadly edged with black, usually with a black tubercle or knob in the middle of the basal part of the upper mandible, which may be accompanied by a smaller one on each side. Usually two series of papillæ bordering the lower lip. Labial teeth in $\frac{3}{4}$ series, the second and third upper short and widely separated in the middle, the first lower short, the three others nearly twice as long and uninterrupted, or the fourth very narrowly interrupted in the middle.

Very distinct lines of crypts on the head and body. One of these lines forms a hoop, the ends of which approach on the upper lip, passing above the nostrils and bordering the eye above and below; another begins behind the eye and bifurcates, the upper branch extending to the upper caudal fin, the lower to the middle of the muscular portion of the tail; a small branch may descend on each side at a short distance behind the eye, forming a sigmoid curve; another, curved line on each side, bordering the spiraculum above. (*cf.* fig. 3, A, p. 598).

Pale brown or rufous above, with dark brown spots; sides with roundish golden spots between a brown or reddish network; belly white, with pale golden or mother-of-pearl spots; throat pink; muscular portion of tail pale brown or yellowish, with small brown or grey spots; caudal crests greyish white, with white and small greyish-brown spots, which are scarcer on the lower crest; usually a few deep black spots on the upper edge of the upper crest.

The largest specimen obtained by me in Brittany measures 59 millim.: body 18, width of body 12; tail 41, depth of tail 15.

The first description and figure of this tadpole were published by Lataste (Actes Soc. Linn. Bord. xxx. 1876, p. 430, pl. x. figs. 7–9). A better figure was given by Héron Royer (Bull. Soc. Zool. France, 1878, pl. iii. fig. 1). Further descriptions have since been given by Héron Royer and Van Bambeke (*l. c.* p. 255, pl. xvii. fig. 1) and by Bedriaga (Bull. Soc. Nat. Mosc. 1889, p. 330).

Rana agilis is now known to inhabit France, from as far north as St. Malo and Paris to the foot of the Pyrenees and the Mediterranean coast, a few localities in Western Germany (Strassburg, Linz on the Rhine, Würzburg), Switzerland, Italy and Sicily, Dalmatia, Austria as far north as Prague, Transylvania, Greece, and the Talysh district in Asia[1].

It breeds a little later than *R. temporaria*, usually, in France, between the middle of February and the beginning of April, but occasionally as late as May (Héron Royer, Bull. Soc. Et. Sc. Angers, xiv. 1884, p. 125), and the young usually leave the water by the end of June or beginning of July. However, this summer, near Dinard, I captured larvæ in which the fore limbs had not yet appeared as late as the 10th August. It is one of these specimens which I have figured on Plate XLV. fig. 7.

8. Hyla arborea, L. (Plate XLVI. figs. 1–3.)

Length of body once and one third to once and a half its width, about half the length of the tail. Nostrils a little nearer the eyes than to the end of the snout. Eyes perfectly lateral, visible from above and from below, a little nearer the spiraculum than to the end of the snout; the distance between the eyes once and a half to twice as great as the distance between the nostrils, which equals the width of the mouth. Spiraculum on the left side, directed upwards and backwards, nearer the posterior than the anterior extremity of the body, not very prominent, but visible from above and from below. Anus opening on the right side, close to the body, above the lower edge of the tail. Tail once and three fourths to twice and one third the length of the body, twice to twice and a half as long as deep,

[1] A species closely resembling *R. agilis*, but the male of which is provided with internal vocal sacs, inhabits China and Japan. The British Museum has recently received several tadpoles of this species, *Rana japonica*, Blgr., obtained in the end of May of this year by Mr. Holst on Tsu-Shima, islands between Southern Japan and Corea.

These tadpoles agree with those of *R. agilis* in their labial dentition, forming $\frac{3}{4}$ series, the first lower series being about half as long as the second; all four lower series uninterrupted. Beak broadly edged with black, without tubercle. Mouth a little wider than the distance between the nostrils, which equals three fifths the width of the interocular space. Lines of muciferous crypts indistinct. Tail twice to twice and one fourth the length of the body, ending in an obtuse point, its depth three to three and a half times in its length. Caudal crests whitish, with small brown spots. Total length 39 millim.

acutely pointed, attenuate or mucronate at the end; upper crest very convex and extending far forwards on the back, almost to between the eyes; lower crest as much developed as the upper, and extending on to the belly considerably beyond the anus; the depth of the muscular portion, at its base, one third or rather less than one third the greatest total depth.

Beak broadly edged with black. Lips bordered with papillæ, which are absent in the middle of the upper border [1], and usually form two rows on the lower lip. Series of labial teeth $\frac{2}{3}$, all except the first lower occupying nearly the whole width of the lip; the second upper is narrowly interrupted in the middle, and so is sometimes the third lower; the first lower series only one third to half as long as the second.

The lines of muciferous crypts can usually be traced without much difficulty: a hoop-shaped one on each side of the head, passing above the nostril and bordering the eye above and below, both ends nearly meeting close to the upper lip, and another along each side of the body to the middle of the muscular portion of the tail.

Olive above, with golden gloss; sides with golden spots; belly white, with pearl-coloured or golden spots; muscular part of tail yellowish, with or without blackish dots and frequently with a median black line at its base; caudal crests whitish, immaculate or more or less profusely dotted and spotted with grey or blackish.

Total length of the largest specimen from Brittany 49 millim.: body 16, width of body 12; tail 33, depth of tail 15.

The Southern form, var. *meridionalis*, Boettger, regarded by some authors as a distinct species (*H. perezi*, Boscá, *H. barytonus*, Héron Royer), differs in its tadpole state, to judge by several specimens from Nice (which I owe to my friend Dr. de Bedriaga), in having the second series of upper labial teeth more broadly interrupted in the middle, and in having the muscular part of the tail bordered above and below by a black line; these two black lines together with a third running along the middle of the tail, which is immaculate or but scantily spotted, give it a peculiar appearance.

The tadpole of the common Tree-Frog has been exquisitely figured by Rösel (Hist. Ran. pl. x., 1758). Far inferior figures are to be found in the works of Lataste (Actes Soc. Linn. Bord. xxx. 1876, pl. x. figs. 4–6) and Lessona (Atti Acc. Lincei, 3, i. 1877, pl. iii. fig. 18). The best descriptions are by Lataste (*l. c.* p. 219), Héron Royer and Van Bambeke (Arch. de Biol. ix. 1889, p. 245, pl. xv. fig. 1), and Bedriaga (Bull. Soc. Nat. Moscou, 1889, p. 476).

Hyla arborea inhabits nearly the whole of the temperate parts of the Palæarctic Region, but is absent from the British Isles.

The eggs are deposited in the end of April or beginning of May, and the young are ready to leave the water from the middle of July to the end of August. A case of hibernation in the larval state has been recorded by Lessona (Atti Acc. Torin. xii. 1877, p. 322).

[1] I have never seen an uninterrupted series of papillæ on the upper lip, as figured by Héron Royer and Van Bambeke.

9. Bufo vulgaris, Laur. (Plate XLVI. fig. 4.)

Length of body about once and a half its width, and three fifths to two thirds the length of the tail. Nostrils much nearer the eyes than to the end of the snout. Eyes on the upper surface; the distance between them about twice as great as the distance between the nostrils, and equal to or somewhat less than the width of the mouth. Spiraculum on the left side, directed backwards, nearly equidistant from either extremity of the body, not very prominent, but visible from above and from below. Anus median. Tail three to four times as long as deep, broadly rounded at the end; both crests nearly equal in depth, with nearly straight and parallel edges; the depth of the muscular part of the tail, at its base, two fifths the greatest total depth.

Beak white, broadly edged with black. Lips with papillæ only at the sides, which form an inward fold; both upper and lower edge toothed, the series of labial teeth being $\frac{2}{3}$; the second upper series nearly as long as the first, and very narrowly interrupted in the middle; the three lower series uninterrupted and occupying nearly the whole width of the lip.

Lines of muciferous crypts not or scarcely traceable.

Blackish brown or black above, blackish grey beneath; muscular part of tail dark brown or blackish; crests grey, finely speckled as if powdered with black.

The tadpole of this, the largest European Batrachian, is very small. The largest specimen measured by me is 32 millim. long: body 12, width of body 8; length of tail 20, depth of tail 5. The recently transformed young measures only 8 to 12 millim. from snout to vent.

Descriptions or figures of the tadpole of *Bufo vulgaris* are given by Rösel (Hist. Ran. p. 94, pl. xxi., 1758), Lataste (Actes Soc. Linn. Bord. xxx. 1876, p. 288, pl. x. figs. 10–12), Héron Royer and Van Bambeke (*l. c.* p. 291, pl. xxiii. fig. 1), and Bedriaga (Bull. Soc. Mosc. 1889, p. 362.)

The Common Toad inhabits the whole of Europe, Northern and Temperate Asia, as far east as Mantchuria, Japan, and China[1], and North-west Africa.

In Central Europe the breeding-season, which lasts only a few days, falls between the beginning of March and the middle of April, and the young leave the water between the middle of May and the end of June.

10. Bufo viridis, Laur. (Plate XLVI. fig. 5.)

Although nearer the latter species, *B. viridis* may be regarded as, in some respects, intermediate between *B. vulgaris* and *B. calamita*; and this view is supported by the characters of the tadpole, which

[1] A specimen was recently obtained by Mr. A. E. Pratt at an altitude of 17,000 feet in the Province of Szc Chuen. In the Alps it does not seem to extend higher up than 7000 feet.

whilst differing from both its congeners in its larger size and its broader internarial space, and approaching *B. vulgaris* in its wide mouth, varies as regards its labial dentition between the two types. Héron Royer and Van Bambeke represent the labial dentition as very similar to that of *B. calamita*; and whilst I have seen Italian specimens which agree tolerably well with the figure given by these authors, I have at the same time examined others from Breslau which would be pronounced as *B. vulgaris*, if that character alone were taken into consideration. The Italian specimens which I have examined all show the second upper labial series widely interrupted in the middle, but extending outwards nearly, or quite, as far as the first; the first lower series measures two thirds to three fourths the length of the second. The large series of specimens (about 50) from Breslau, for which I am indebted to the kindness of Prof. Born, shows every passage between the widely interrupted second upper series of teeth and one that differs in no respect from that of *B. vulgaris*; the length of the first lower series varies from one half to three fourths the length of the second.

Distance between the eyes about once and a half the distance between the nostrils, and equal to the width of the mouth. Tail three to four times as long as deep, broadly rounded at the end, its upper crest more convex than in *B. vulgaris* and a little deeper than the lower; the depth of the muscular part of the tail about half the greatest total depth.

Brown or greyish olive above, uniform or with small darker spots; belly greyish white; caudal crests greyish white, with or without small brown spots or dots.

The following are the measurements of the largest specimen, from Breslau, examined by me:—Total length 44 millim.: body 18, width of body 13; tail 26, depth of tail 9. The recently transformed young measures from 10 to 17 millim. from snout to vent.

The tadpole of *B. viridis* has been described by Héron Royer and Van Bambeke (*l. c.* p. 293, pl. xxiii. fig. 3) and by Bedriaga (Bull. Soc. Nat. Mosc. 1889, p. 387).

This species has a very wide geographical range. It inhabits the whole of Central and Southern Europe as far west as the Rhine and the Alps, the Balearic Islands, North Africa, and South-western and Central Asia as far east as Mongolia, Eastern Turkestan, Afghanistan, and the Himalayas. In Europe it is known to reach an altitude of nearly 6500 feet in the Alps of Savoy (R. Blanchard, Bull. Soc. Zool. France, 1888, p. 67); and in Asia it ascends the Himalayas to about 15,000 feet (Stoliczka, Journ. As. Soc. Beng. xxxix. 1870, p. 155), which is, next to the altitude of 17,000 feet reached by *Bufo vulgaris*, the highest point from which a Batrachian has ever been recorded.

The breeding-season falls between that of *B. vulgaris* and that of *B. calamita*, lasting from the beginning of April to the middle of June. Like *B. vulgaris* and unlike *B. calamita*, which is never to be found in the water except at night, the breeding individuals make a prolonged sojourn in the water.

11. Bufo calamita, Laur. (Plate XLVI. fig. 6.)

The tadpole of the Natterjack differs from that of the Common Toad in the narrower mouth, which measures less than the interocular space and a little more than the distance between the nostrils; the somewhat more convex upper caudal crest; and the lesser length of the second series of upper labial teeth, which is very broadly interrupted in the middle.

Black above, sides and belly dark lead-grey, with pale bronzy dots; caudal crests grey, finely speckled with black; throat and chin sometimes whitish; the light vertebral line, characteristic of this species, sometimes present before the appearance of the fore limbs.

This is the smallest European tadpole, seldom reaching the length of 30 millim. recorded by Bedriaga. The following are the measurements of the largest of hundreds of specimens examined by me:—Total length 25 millim.: body 10, width of body 7; tail 15, depth of tail 5. I have seen recently transformed young measuring only 7 millim. from snout to vent.

The only figure ever given of this tadpole is that accompanying Lataste's description (Actes Soc. Linn. Bord. xxx. 1876, p. 297, pl. xi. figs. 1–3); the mouth is described and figured by Héron Royer and Van Bambeke (*l. c.* p. 295, pl. xxiv. fig. 1), and detailed descriptions are given by Bedriaga (Bull. Soc. Nat. Mosc. 1889, p. 406, and 'Larves des Batraciens de Portugal,' Coïmbra, 1891, p. 10).

The habitat of *Bufo calamita* extends from the extreme West of Europe[1] to Western Russia, the species becoming gradually scarcer or more local from West to East; it is entirely absent from Italy and South-eastern Europe.

The breeding-season lasts from the middle of April to the middle of July; it is by no means unusual to find in June and in the beginning of July, together in one and the same spot, ova, tadpoles, and recently transformed young of this species.

12. Pelobates fuscus, Laur. (Plate XLVI. fig. 7.)

Length of body once and a half to twice its width, two thirds to one half the length of the tail. Nostrils a little nearer the eyes than to the end of the snout. Eyes on the upper surface of the body, equidistant from the end of the snout and the spiraculum, the distance between them at least twice, sometimes nearly three times as great as that between the nostrils, and considerably greater than the width of the mouth. Spiraculum on the left side[2], directed upwards and backwards, equidistant from either extremity of the body or a little nearer the anterior extremity, visible from above and from below. Anal opening median, a little larger than the spiraculum, and close to the body. Tail twice and a half to thrice and one

[1] From Scotland and Ireland to the South of Spain.

[2] Héron Royer (Bull. Soc. Zool. France, 1884, p. 162) has recorded two interesting teratological cases in this tadpole: one with two spiracula, the other with the spiraculum on the right side instead of the left.

fifth as long as deep, acutely pointed; upper crest convex, slightly deeper than the lower, not extending far upon the back; the depth of the muscular portion, at its base, about half the greatest total depth.

Beak black. Lip bordered with papillæ, which form two or more rows on the sides; the papillose border interrupted mesially by a narrow toothed descending lobe, which appears at first sight as continuous with the second upper series of teeth[1]; this anterior series is followed by three or four other series of teeth, which are all widely interrupted in the middle and gradually decrease in length; the fourth, if at all present, being extremely short. On the lower lip we see likewise a short outer series, followed by three or four much longer ones, all of which, with the occasional exception of the first, are interrupted in the middle and may be more or less broken up on the sides. The series of labial teeth may therefore be formulated as $\frac{4}{4}$ or $\frac{5}{5}$. Small isolated teeth may also be scattered on the papillæ at the angles of the mouth.

I have not been able to distinguish lines of crypts beyond the two series which run from the end of the snout to the upper border of the eyes, passing between the nostrils. I am therefore unable to judge whether the dorsal lines have been correctly figured by Lessona (Atti Acc. Lincei, 3, i. 1877, pl. v. figs. 20 & 28), who rightly regards the figure given by Cornalia (Atti Soc. Ital. xvi. 1873, pl. iii. *a.*) as fanciful. From what I know of other tadpoles, I can hardly believe in the arrangement described by Lessona, especially as so great a difference from the allied *P. cultripes*, figured by Lataste (Actes Soc. Linn. Bord. xxxiii. 1879, p. 313), appears very improbable.

The advanced tadpole of *P. fuscus* is brown or olive-brown above, with or without small darker spots, greyish white beneath; sides with roundish whitish or pale golden spots; tail pale brown, with small grey and whitish spots.

The body usually reaches at least the size of a pigeon's egg, but not unfrequently exceeds that size. The largest specimen in the British Museum, from Prague, measures 125 millim.: body 38, width of body 25; tail 87, depth of tail 27. The largest specimen

[1] And is so figured by Héron Royer and Van Bambeke (Arch. de Biol. ix. 1889, pl. xix. fig. 1) as characteristic of *P. fuscus,* such as it occurs in France. But specimens from Paris, which I received from M. Héron Royer himself, show exactly the same arrangement as described and figured (*l. c.* pl. xviii. fig. 7) in *Pelobates* from Belgium, Germany, and Italy. Had the difference been a real one, M. Héron Royer might have reflected on my remarks (Bull. Soc. Zool. France, 1888, p. 115) to the effect that if there exist two distinct forms confounded under the name of *P. fuscus,* it is the French form that is to be distinguished and not the Italian, which agrees best with the typical *P. fuscus* of Germany. On reading Héron Royer and Van Bambeke's account, one might feel inclined, on the evidence of the differences shown by their figures, to accept such a distinction; but, considering that the Parisian tadpoles do not in any way differ in their labial characters from the German, as figured by F. E. Schulze and Gutzeit, nor from the specimens from Prague, Basle, and Denmark, with which I have compared them, I feel justified in regarding Héron Royer's figure (*l. c.* pl. xix. fig. 1) as incorrect.

on record is one preserved in the Berlin Museum, obtained in December 1867, on the Jungfernheide, near Berlin, and which measures 175 millim. (E. v. Martens, Sitzb. Ges. nat. Fr. Berl. 1867, p. 35).

The masterly figures given by Rösel (Hist. Ranar. pl. xviii., 1758) are still unequalled. The structure of the mouth and lips has been described and figured by Van Bambeke (Bull. Ac. Belg. 2, xvi. 1863, p. 341, pl. i.), F. E. Schulze (Abh. Ak. Berl. 1888, p. 4, pls. i.–iv.), Héron Royer and Van Bambeke (Arch. de Biol. ix. 1889, pl. xviii. fig. 7, and pl. xix. fig. 1), and Gutzeit (Zeitschr. wiss. Zool. xlix. 1889, p. 50, pl. ii. fig. 16).

Pelobates fuscus has a wide distribution, being locally distributed over Germany, Austria, Russia, Southern Sweden, Denmark, Belgium, Northern and Central France, the North-western extremity of Switzerland, Piedmont, Lombardy, and Bologna [1].

Owing to its burrowing habits, *Pelobates fuscus* is only found in localities where the soil is particularly light, and it usually chooses deep ponds for depositing its spawn. The breeding-season falls normally between the end of March and the beginning of May; but it has been observed near Ghent, in Belgium, as late as the 21st of July (Van Bambeke, in Héron Royer, Bull. Soc. Et. Sc. Angers, xv. 1885, p. 72). The larvæ usually transform in July and August; that, under special circumstances, the larvæ may hibernate, is shown by the observations of Kollmann (Rec. Zool. Suisse, i. 1883, p. 75) and Pflüger (Arch. f. Ges. Phys. xxxi. 1883, p. 134).

13. Pelobates cultripes, Cuv. (Plate XLVI. fig. 8.)

Differs from the preceding in the following points:—The nostrils are wider apart, the distance between them equalling the width of the mouth, or at least one half the width of the interocular space. The series of labial teeth are more broken up, and their arrangement is therefore less easily expressed by a formula, although practically of the same type as in *P. fuscus*. According to Héron Royer, each series presents several curves; but such an arrangement is not distinctly shown by the tadpoles before me, which I owe to M. Héron Royer himself; that character is therefore not constant. The tail is shorter, hardly once and a half the length of the body. The lines of crypts are usually more distinct than in the allied species, owing to the black colour of the tubules; their arrangement has been figured by Lataste (*cf. supra*, p. 615), who at the same time observes that they are liable to no inconsiderable individual variation.

The colour is described by Lataste as reddish yellow above, greyish or bluish white beneath; tail with small brown spots.

[1] As noticed by Crivelli (Rend. Ist. Lomb. 2, vi. 1873, p. 174) and Camerano (Boll. Mus. Torin. i. 1886, no. 9), it may be seen, by referring to Spallanzani's Dissertations Nat. Hist. An. & Veget. (Engl. transl. ii. p. 122, London, 1784), that *P. fuscus* was first discovered in Italy, at Pavia, as early as 1780. The animal is described by Spallanzani in an unmistakable manner.

According to Dugès, the size of the body may equal a hen's egg. The specimens from the Dép. Hérault, preserved in the British Museum, and for which I am indebted to the kindness of M. Héron Royer, are much smaller:—Total length 62 millim.: body 25, width of body 15; tail 37, depth of tail 12.

Figures by Dugès (Rech. Ostéol. Myol. Batr. 1835, pl. xiii. fig. 80, and pl. add. fig. 8), Des Moulins (Actes Soc. Linn. Bord. xxix. 1874, pl. vi.), and Lataste (Actes Soc. Linn. Bord. xxx. 1876, pl. x. figs. 1–3, and xxxiii. 1879, p. 313).

Inhabits the South of France, extending on the West coast as far north as the Loire-Inférieure, Spain, and Portugal.

14. Pelodytes punctatus, Daud. (Plate XLVII. figs. 1, 2.)

Length of body rather more than once and a half its width, and not quite two thirds the length of the tail. Nostrils halfway between the end of the snout and the eyes, or a little nearer the latter. Eyes on the upper surface of the body, equidistant from the end of the snout and the spiraculum, the distance between them about twice as great as that between the nostrils, and equal to the width of the mouth. Spiraculum on the left side, directed upwards and backwards, nearly equidistant from either extremity of the body, visible from above and from below. Anal opening median, much larger than the opening of the spiraculum. Tail twice and a half to three times as long as deep, ending in an obtuse point; the upper crest very convex, deeper than the lower, and rarely extending forwards as far as the level of the spiraculum; the depth of the muscular portion, at its base, one third to two fifths of the greatest total depth.

Beak white, with a black margin. An inverted fold at the side of the lip; this is furnished with a single row of papillæ except on the upper border, which is toothed. Labial teeth in $\frac{4}{4}$ or $\frac{5}{5}$ series, the second and third, both above and below, the longest; the first and second series in both divisions of the lip uninterrupted, or the second upper with very slight median interruption, the others separated in the middle and gradually decreasing in length to the last, which, if present, is short. According to Bedriaga, there may be as many as six series of teeth on the lower lip, the first three of which are uninterrupted.

Lines of crypts usually very apparent, but sometimes very indistinct. On the head they approach each other between the nostrils and completely border the eye posteriorly, the anterior extremities of this naso-orbital hoop approaching each other above the upper lip. Of the two dorsal lines, which diverge posteriorly, the upper, extending to the upper edge of the muscular portion of the tail, is interrupted at a short distance behind the eye; its anterior portion may even descend to join the lower line, which thus appears bifurcated in front; the lower line extends, usually uninterrupted, from behind the eye to the middle of the muscular portion of the tail, where it is lost; both lines, however, may stop short of the tail. A sinuous line on the flanks, curved above the spiraculum, not bent upwards posteriorly, sometimes extending nearly to the origin of the hind limbs. In addition to these lines, a short horizontal branch originates above the upper lip, and, bifurcating below the vertical of the anterior border of the eye, forms a hoop which descends to the sides of the throat. The arrangement of these lines is figured on p. 598 of this paper.

Coloration usually varying from pale grey to olive-brown above, the sides with pale metallic spots; the lines of crypts whitish; caudal crests greyish, with blackish spots and white dots and pale metallic spots. Some specimens, however, have the tail almost spotless; in others, on the contrary, it is very closely spotted, but always less abundantly on the lower crest than on the upper. Lower parts pale grey with silvery spots. Tail and the greater part of the body with fine black decussating lines, as in *Bombinator*; it sometimes happens that these lines are altogether absent on the muscular part of the tail.

But, as in other tadpoles, coloration is subject to a great amount of variation. During a stay of seven weeks in Brittany last summer, I was much struck on finding, in the beginning of July, near St. Enogat, Ille-et-Vilaine, a small and shallow pond, about 15 feet long by 10 feet wide and 2 feet deep, swarming with thousands of tadpoles from 30 to 40 millim. long, of a very dark brown, almost black, which, although I am familiar with the larvæ of *Pelodytes,* I at first failed to recognize. It was only after a careful examination that I ascertained the species to which they belong, my determination being ultimately confirmed by the transformation of some of the tadpoles which I had brought home alive. Now several ponds close by, whether large or small, deep or shallow, of clear or of thick muddy water, all showed the ordinary type of *Pelodytes*-tadpole. I constantly visited the spot: the water, which at first was perfectly clear and transparent, became green and dirty, but the larvæ did not alter in colour or size; and I was surprised at the small size of the young immediately after transformation, which did not exceed 11 to 15 millim. from snout to vent, whilst the other places yielded young varying between 19 and 22 millim. Towards the middle of August the little pond was taken up for those linen-washing operations with which all who have visited Brittany are unpleasantly familiar, and my observations were thus terminated by the wholesale destruction of the tadpoles. But those, still numerous, which had remained up to that time had not undergone any change. As I have said above, these tadpoles were nearly black on the back; the tail was of a dark brown without any, or with but very small, black spots, and with the black decussating lines so crowded that they could not be detected without a lens; the belly was of a beautiful steel-blue, and the lines of crypts were quite indistinct, although they have become distinguishable now that the specimens have been for some time in spirit. One of these black tadpoles is figured, Plate XLVII. fig. 2.

The largest measured: body 16 millim., width of body 10; tail 24, depth of tail 8. The young were by no means melanotic, but possessed of the usual grey, green-spotted coloration. Their small size alone distinguished them.

It is clear that the abnormal colour of these tadpoles was not due to the surroundings at the time I observed them, as the water in which they lived underwent various changes during the five weeks I watched the pool; and specimens which I brought home and kept under the same conditions as normal larvæ did not change colour. I am therefore able to confirm the conclusions arrived at by Héron Royer, from observations on larvæ of *Alytes obstetricans* (Bull. Soc. Zool. France, 1878, p. 65), that is, that the coloration is due to the conditions under which the larva develops on leaving the egg; and that after that time, the pigment-cells becoming fixed and less sensitive, little or no alteration takes place until the end of the larval period.

The largest tadpole of *Pelodytes* obtained by me in Brittany measures 57 millim.: body 21, width of body 15; tail 36, depth of tail 14. A specimen from Nice, received from Dr. de Bedriaga, measures 65 millim.

We are indebted for the first account of this tadpole to Héron Royer (Bull. Soc. Zool. France, 1878, p. 131, pl. iii.), who pointed out that the larva described and figured by Lataste as of *Pelodytes* is that of *Alytes obstetricans.* He, however, erroneously represented the lines of muciferous crypts as decussating on the forehead; and this error was soon corrected by Lataste (Actes Soc. Linn. Bord. xxxiii. 1879, p. 309). Further notes were contributed by Héron Royer (Bull. Soc. Zool. France, 1879, p. 229, pl. xi.), and by the same author in conjunction with Van Bambeke (Arch. de Biol. ix. 1889, p. 277, pl. xx. figs. 5–12). The best description is that given by Bedriaga (Bull. Soc. Nat. Mosc. 1889, p. 539), who for the first time notices the pigmentary decussating lines.

The habitat of *Pelodytes punctatus* is restricted to France, where it occurs nearly everywhere with the exception of the central Plateau and the extreme North-east, being recorded as far north as the Pas-de-Calais (Giard, Bull. Sc. Fr. Belg. xxii. 1890, p. 87), Spain and Portugal, Liguria (Doria, Ann. Mus. Genova, xxiv. 1887, p. 388), and Piedmont (Peracca, Boll. Mus. Torin. i. 1886, no. 1).

The tadpole usually lives in flooded quarries. I have found it in Brittany in company with tadpoles of *Rana esculenta, R. agilis, Bufo calamita,* and *Hyla arborea.*

A. Thomas (Ann. Sc. Nat. 4, i. 1854, p. 290) appears to have been the first to notice, at Nantes, that *Pelodytes* breeds not only in the spring, but also in the autumn; and he assigned to this species two broods a year—the first from the end of February to the beginning of April, the second from the end of September to the beginning of October. Lataste (Actes Soc. Linn. Bord. xxix. C. R. 1874, p. cli) has witnessed its breeding, near Bordeaux, on the 22nd May, and (Actes Soc. Linn. Bord. xxxi. 1876, p. 11) near Paris on the 8th July. Thomas's statement regarding the autumnal breeding has been contested by Héron Royer (Bull. Soc. Zool. France, 1878, p. 131, and Bull. Soc. Et. Sc. Angers, 2, xv. 1885, p. 103), but is confirmed by Bedriaga's observations at Nice, where he has found the frog pairing from the end of February to May, and again in October and November. I have myself this summer, at St. Enogat, observed specimens pairing on the 21st August. Late offspring of course hibernate in the larval condition, as ascertained by Bedriaga (Bull. Soc. Nat. Mosc. 1889, p. 542), who obtained near Nice, on the 10th March, in one and the same pond, full-grown tadpoles, spawn, and breeding individuals. Larvæ of *Pelodytes* may therefore be found all the year round.

15. Discoglossus pictus, Otth. (Plate XLVII. fig. 3.)

Length of body once and two thirds its width, two thirds to one half the length of the tail. Eyes on the upper surface of the body, the distance between them about once and a half the distance between the nostrils, equal to or slightly less than the width of the mouth. Spiraculum in the mid-ventral line, equally distant from either extremity of the body. Anal opening median, larger than the spiraculum. Tail three to four times as long as deep, broadly rounded at the end, as in *Bufo vulgaris*, both upper and lower crests but very feebly convex, the former not extending upon the back; the depth of the muscular part at its base one half to two fifths the total depth.

Mouth elliptical. Beak white, edged with black. Lips bordered by a single series of papillæ, which are usually narrowly interrupted in the middle of the upper lip; a well-marked chink on each side of the lower lip. Series of labial teeth $\frac{2}{3}$, occupying the whole width of the lips, the third lower interrupted in the middle; the first upper and the first lower series formed of one or two rows of teeth, the others constantly of two[1]. I can distinguish the ordinary lines of crypts on the head, and also one running along each side of the back.

Brown above, whitish below; caudal crests whitish, uniform or with small brown dots. The whole body and tail with a network of fine brown lines forming polygonal meshes; this network most easily traceable on the tail.

Total length 33 millim.: body 12, width of body 7; tail 21, depth of tail 6.

The tadpole of *Discoglossus* was first described and figured by Lataste in his "Etude sur le Discoglosse" (Actes Soc. Linn. Bord. xxxiii. 1879, p. 287, pl. v. figs. 1–4); and his account has been supplemented by Héron Royer (Bull. Soc. Zool. France, 1885, p. 565, pl. xiv.), Héron Royer and Van Bambeke (*l. c.* p. 280, pl. xxi. fig. 1), and Bedriaga (Bull. Soc. Nat. Mosc. 1889, p. 557).

Discoglossus pictus inhabits Spain and Portugal, Corsica, Sardinia, Sicily, Malta, and small neighbouring islands, Morocco, Algeria, and Tunisia. Its breeding-season lasts from February (in Algeria) to the end of summer.

[1] The duplex disposition of these teeth has been overlooked by Héron Royer and Van Bambeke, who state that all the teeth form single series. Such is certainly not the case in the specimens examined by me, some of which were named by M. Héron Royer himself.

16. Bombinator igneus, Laur. (Plate XLVII. fig. 4.)

Length of body once and one fourth to once and one third its width, four fifths to two thirds the length of the tail. Eyes on the upper surface of the body, the distance between them twice and a half to three times as great as that between the nostrils, equal to or slightly less than the width of the mouth. Spiraculum in the mid-ventral line, nearer the posterior than the anterior extremity of the body. Anal opening median, much larger than the spiraculum. Tail twice to twice and a half as long as deep, ending in an obtuse point; the upper crest convex, not or but slightly deeper than the lower, and extending upon the back; the depth of the muscular part, at its base, one half to two fifths the total depth.

Mouth triangular. Beak white, bordered with black. Lips bordered by a series of papillæ; a well-marked chink on each side of the lower lip; series of labial teeth $\frac{2}{3}$, occupying the whole width of the lips, all uninterrupted, or the third lower broken up in the middle; the first upper and the first lower series formed of two or three rows of teeth, the others of two, three, or four.

Well-marked series of muciferous crypts; one on each side of the head, from above the upper lip, passing above the nostril and bordering the eye, then descending towards the upper lip, where it curves and ascends to below the eyes; two series on each side of the back, beginning at some distance behind the eye, the upper extending to the upper portion of the muscular part of the tail, the lower very short and parallel to the upper; and finally a short curved series on each side of the belly.

Brown above, greyish white below; the series of muciferous crypts whitish; tail greyish, with or without small brown spots. A network of fine black lines crossing each other at right angles is spread over the whole tadpole, but most distinct on the caudal crests.

Total length 50 millim.: body 20, width of body 16; tail 30, depth of tail 15. These measurements are taken from a specimen from Denmark, received from Prof. Lütken.

This tadpole has been described and figured by Héron Royer, Bull. Soc. Zool. France, 1887, p. 647, pl. xii.

Bombinator igneus inhabits the plains of Northern and Eastern Germany[1], Denmark, Southern Sweden, Austria, Roumania, and Russia. Breeds in May and June.

17. Bombinator pachypus, Fitz. (Plate XLVII. fig. 5.)

One very striking character distinguishes this tadpole from the preceding, viz. the shape of the mouth, which is elliptical as in the other genera of *Discoglossidæ*. Otherwise, I have not been more successful than Héron Royer in discovering any constant characters by which to distinguish it. The tail is, as a rule, rather shorter,

[1] Bedriaga, in his excellent recent work on the Batrachians of Europe (*l. c.* p. 590), is mistaken in recording this species from the Lower Main district on the authority of Koch. Both Koch's var. *typus* and var. *brevipes* represent *B. pachypus*, as is perfectly clear from his allusion to the "gelbes Endglied" of the toes in the former.

and the muciferous crypts, so distinct in *B. igneus*, are hardly distinguishable in the tadpoles of this species, of which I obtained a number in the Duchy of Luxemburg. However, it is very probable that such a difference would not prove constant if tested on more extensive material.

The largest specimen collected by me measures 37 millim.: body 17, width of body 14; tail 20, depth of tail 10.

Descriptions or figures are given by Lataste (Actes Soc. Linn. Bord. xxx. 1876, p. 278, pl. ix. figs. 10–12), Héron Royer and Van Bambeke (Arch. de Biol. ix. 1889, p. 282, pl. xxi. fig. 6), and Bedriaga (Bull. Soc. Nat. Mosc. 1889, p. 573). The decussating pigmentary lines appear to have been first noticed by Leydig (N. Acta Ac. Leop.-Carol. xxxiv. 1868, p. 105, pl. ii. fig. xix., and An. Batr. D. Faun. p. 56); and Pflüger (Arch. f. Ges. Phys. xxxi. 1883, p. 139) has dwelt on the importance of this character for distinguishing this tadpole from that of *Alytes*. The classical work of Götte (Entwickelungsgeschichte der Unke, Leipzig, 1875, with atlas) is devoted to the embryology of this species.

This species, which has long been confounded with the preceding, inhabits France, Belgium, Switzerland, Western and Central Germany, Austria, Roumania, Italy, Dalmatia, Greece, and Turkey. It breeds from the latter half of May to the end of June, and the young leave the water in August or September.

18. Alytes obstetricans, Laur. (Plate XLVII. figs. 6, 7.)

Length of body once and one third to once and a half its width, two thirds to one half the length of the tail. Nostrils nearly halfway between the end of the snout and the eyes. Eyes on the upper surface of the body, the distance between them about twice as great as that between the nostrils, and equal to or slightly greater than the width of the mouth. Spiraculum in the mid-ventral line, a little nearer the anterior than the posterior extremity of the body. Anal opening median, very much larger than the spiraculum. Tail twice and two thirds to thrice as long as deep, ending in an obtuse point; the upper crest convex, usually a little deeper than the lower, and extending but very slightly upon the back; the depth of the muscular portion, at its base, about half the total depth.

Beak white, with a broad black margin. Lip entirely surrounded by a series of papillæ. Labial teeth in $\frac{2}{3}$ series, occupying nearly the whole width of the inner surface of the lip, all continuous, or the third lower narrowly broken up in the middle; the first upper and the first lower series composed of one or two rows of teeth, the others composed of two or three rows.

Lines of crypts usually very indistinct, all that can be distinguished being the usual lines from the end of the snout between the nostrils, bordering the eyes above, behind, and below, and forming a hoop on each side of the upper lip, a line beginning at a considerable distance behind the eye along each side of the back to the upper border of the muscular part of the tail, and another very short line close to and parallel with the anterior extremity of the latter. But in a fine specimen from Ballaigues, Switzerland, sent to me by my friend Dr. de Bedriaga, the lines of crypts are much more distinct and blackish; in addition to the series described above, it shows the second dorsal line prolonged to the base of the tail, which also bears two lines, the upper being on the upper caudal crest; a short series descends vertically from below the centre of the eye, another, curved, from below the anterior extremity of the dorsal lines, a third on each side of the mouth, and a fourth extends on each side of the belly, from the level of the spiraculum nearly to the origin of the hind limbs, its anterior extremity bent downwards and forwards. This specimen is figured above, p. 598, fig. 3, C.

Lead-grey to blackish above, uniform or with round blackish spots; sides with large silvery or pale golden spots; belly greyish white with metallic spots; tail with numerous dark brown dots or round black spots, which are very apparent on the greyish-white crests. Nearly black tadpoles are on record (Héron Royer, Bull. Soc. Zool. France, 1878, p. 62), and an albino has been figured (Lataste, Actes Soc. Linn. Bord. xxxiv. 1880, pl. xi.).

The largest tadpoles I have seen were obtained by me in company with my friend M. Lataste, in May 1882, at St. Germain-en-Laye, near Paris. The following are the measurements of one of them:—Total length 80 millim.: body 28, width of body 21; tail 52, depth of tail 19. Héron Royer and Van Bambeke also mention specimens 85 millim. long, and Fischer-Sigwart ('Das Thierleben im Terrarium,' Zofingen, 1889, p. 61) gives 90 millim. as the maximum length; but this size is exceptional, some specimens, although full-grown, not exceeding 40 millim.

I cannot find any constant character differentiating the Spanish-Portuguese tadpoles (var. *boscæ*, Lataste) from the typical form, except that the tail is usually spotted with deeper black.

The tadpole of *Alytes obstetricans* has been described and figured many times. In addition to the anatomical works of C. Vogt (Unters. üb. d. Entwickl. d. Geburtshelferkröte, Solothurn, 1842), Keiffer (Arch. de Biol. ix. 1888, p. 55, pls. iii. & iv.), and Héron Royer and Van Bambeke (*t. c.* p. 285, pl. xxii. fig. 1), containing information respecting the buccal characters, the contributions must be mentioned of Pontallié (Ann. Sc. Nat. 3, xviii. 1852, p. 248), Lataste (Actes Soc. Linn. Bord. xxi. 1876, p. 446, pl. ix. figs. 1–3, 7–9), Héron Royer (Bull. Soc. Zool. 1878, p. 132, pl. iii. figs. 9–11), and Bedriaga (Bull. Soc. Nat. Mosc. 1889, p. 603, and "Les Larves des Batraciens de Portugal," Coïmbre, 1891, p. 12).

The Midwife Toad is common nearly all over France[1], in Belgium (Provinces of Namur, Liége, and Luxemburg), in Switzerland, distributed locally in Germany as far east as Brunswick and Thuringia (Nehring, Sitzb. Ges. nat. Fr. Berl. 1887, p. 48, and Naturw. Wochenschrift (Berlin), v. 1890, p. 278; Wolterstorff, Zool.

[1] I have failed to find it in the northern parts of Ille-et-Vilaine and the adjoining parts of the Côtes-du-Nord, although the species is said by Pontallié to be quite common near Rennes.

Anz. 1891, p. 65). It has been found as high up as 5000 feet in Switzerland (Fatio, Vert. Suisse, iii. p. 362) and 6500 feet in the Pyrenees. In Spain and Portugal it is represented by a distinct variety (var. *boscæ*, Lataste).

Its tadpole is one of the most useful for anatomical and physiological purposes, both on account of its size and the facility with which it can be procured, being abundant wherever it exists and found all through the year, often remaining two years before transforming (Wiedersheim, Zool. Anz. 1878, p. 104). The breeding-season lasts from the spring to the end of summer. The tadpole, which does not leave the egg until after the loss of the (uncommonly large) external gills, is usually deposited in small reservoirs, cow-ponds, flooded quarries, pits in brick-fields, &c. For accounts of the breeding-habits of *Alytes obstetricans*, consult A. de l'Isle du Dréneuf, Ann. Sc. Nat. 6, iii. 1876, art. 7, and Héron Royer, Bull. Soc. Zool. France, 1886, p. 671.

19. Alytes cisternasii, Boscá. (Plate XLVII. fig. 8.)

I am indebted to M. Ed. Boscá, the discoverer of this very distinct species, for several tadpoles, from the Sierra Morena, at different stages of development. The largest measures 69 millim.: body 20, width of body 15; tail 42, depth of tail 14.

I regret to be unable to detect any character by which this tadpole may be surely distinguished from that of *A. obstetricans*. Héron Royer and Van Bambeke state that the labial teeth are less distinctly arranged in double rows, and their figure, in fact, represents the second upper series only as formed of a double row. Bedriaga, on the contrary, describes the first upper series as with two rows of teeth and the second with two or three, the first and second lower series with two rows and the third with three, just as is usually the case in *A. obstetricans*. I find constantly two rows in the first upper aud first lower series, two or three in the second upper, two in the second lower, and two or three in the third lower. Bedriaga adds that the tail is shorter than in *A. obstetricans*, only about once and a half the length of the body; this difference, again, is not borne out by our specimens, as may be seen from the measurements given above.

Tail with small black spots, more crowded and often forming vermiculations on the muscular portion of the tail, the space occupied by the lateral groove being, however, usually free from spots.

The tadpole of *A. cisternasii*, which inhabits Spain and Portugal, has been figured by Boscá (An. Soc. Esp. x. 1881, pl. ii. figs. 4–6) and described by Héron Royer and Van Bambeke (*l. c.* p. 289, pl. xxii. fig. 5) and by Bedriaga (Larves des Batraciens de Portugal, Coïmbre, 1891, p. 14). It is to be found all the year through (Boscá, Bull. Soc. Zool. France, 1880, p. 253).

APPENDIX.

List of the Specimens preserved in the British Museum.

(N.B.—No number of specimens higher than ten in each bottle is recorded in this list.)

1. *Rana esculenta.*

1–10.	Near St. Malo.	G. A. Boulenger, Esq. [P.].	
11–12.	Bologna.	Prof. Bianconi [P.].	
13–22.	Prague.	Hr. V. Fritsch [C.].	var. *ridibunda.*
23–27.	Coimbra.	Dr. J. de Bedriaga [P.].	var. *ridibunda.*
28–32.	Algeria.	M. Héron Royer [E.].	var. *ridibunda.*

2. *Rana arvalis.*

1–4.	Copenhagen.	M. Héron Royer [E.].
5–14.	Halle/S.	Dr. W. Wolterstorff [E.].
15–24.	Breslau.	Prof. G. Born [P.].

3. *Rana temporaria.*

1–10.	Near London.	G. A. Boulenger, Esq. [P.].
11–15.	Själland, Denmark.	Copenhagen Museum.
16–22.	Rossazza, Alpes de Biella, 3100 feet.	Prof. L. Camerano [P.].
23–32, 33–36.	Ceresole Reale, 5600 feet.	Prof. L. Camerano [P.].
37–46.	Alpe la Vecchia, Biellesl, 7000 feet.	Prof. L. Camerano [P.].

4. *Rana græca.*

1–10.	Parnassos.	Dr. Krüper [P.].

5. *Rana iberica.*

1–2.	Coimbra.	Dr. J. de Bedriaga [P.].
3–4.	Portugal.	M. Héron Royer [E.].

6. *Rana latastii.*

1.	Italy.	M. Héron Royer [E.].

7. *Rana agilis.*

1–10.	Near St. Malo.	G. A. Boulenger, Esq. [P.].
11–14.	Near Paris.	M. Héron Royer [E.].

8. *Hyla arborea.*

1–10, 11–20.	Near St. Malo.	G. A. Boulenger, Esq. [P.].
21–30.	Near Nice.	Dr. J. de Bedriaga [P.]. (Var. *meridionalis.*)

9. *Bufo vulgaris.*

1–10.	Near London.	G. A. Boulenger, Esq. [P.].
11–14.	Själland, Denmark.	Copenhagen Museum.
15–19.	Near Nice.	Dr. J. de Bedriaga [P.].

10. *Bufo viridis.*

1.	Bonn.	Dr. J. de Bedriaga [P.].
2–6.	Fildmoching, near Munich.	Dr. W. Wolterstorff [E.].
7–16.	Breslau.	Prof. G. Born [P.].
17–18.	Italy.	M. Héron Royer [E.].
19–22.	Near Turin.	Prof. L. Camerano [P.].
23–28.	Ischia.	Copenhagen Museum.
29–30.	Pizzo, Calabria.	Prof. H. Giglioli [P.].
31–40.	Do Shak, Afghanistan.	Dr. Aitchison [C.].

11. *Bufo calamita.*

1–10.	Near St. Malo.	G. A. Boulenger, Esq. [P.].
11–15.	Mertola, Portugal.	Dr. J. de Bedriaga [P.].

12. *Pelobates fuscus.*

1–3.	Near Paris.	M. Héron Royer [E.].
4–5.	Near Basle.	Dr. F. Müller [P.].
6–15.	Halle/S.	Dr. W. Wolterstorff [E.].
16–25.	Prague.	Hr. V. Fritsch [C.].
26–29.	Själland, Denmark.	Copenhagen Museum.
30.	Bologna.	Prof. Bianconi [P.].

13. *Pelobates cultripes.*

1–2.	Hérault.	M. Héron Royer [E.].

14. *Pelodytes punctatus.*

1–10, 11–20.	Near St. Malo.	G. A. Boulenger, Esq. [P.].
21–27.	Near Paris.	M. Héron Royer [E.].
28–37.	Cimiez, near Nice.	Dr. J. de Bedriaga [P.].

15. *Discoglossus pictus.*

1–2.	Montecristo Island.	Prof. H. Giglioli [P.].
3–6.	Algiers.	Dr. J. de Bedriaga [P.].
7–14.	Algeria.	M. Héron Royer [E.].

16. *Bombinator igneus.*

1–5.	Magdeburg.	M. Héron Royer [E.].
6–11.	Själland, Denmark.	Copenhagen Museum.

17. *Bombinator pachypus.*

1.	Gironde.	Copenhagen Museum.
2–5.	France.	M. Héron Royer [E.].
6–15.	Mondorf, Luxemburg,	G. A. Boulenger, Esq. [P.].
16–20.	Niederfellendorf, Franconia.	Dr. W. Wolterstorff [E.].

18. *Alytes obstetricans.*

1–10.	Near Paris.	G. A. Boulenger, Esq. [P.].	
11–17.	St. Germain-en-Laye.	G. A. Boulenger, Esq. [P.].	
18–20.	Bonn.	Dr. J. de Bedriaga [P.].	
21–24.	Freiburg i. B.	Dr. J. de Bedriaga [P.].	
25.	Ballaigues, Switzerland.	Dr. J. de Bedriaga [P.].	
26–31.	Lac Bleu, Hautes-Pyrénées, 6500 feet.	Dr. L. Joubin [E.].	
32–33.	Corunna.	M. V. L. Seoane [P.].	(Var. *boscæ.*)
34–37.	Coimbra.	Dr. J. de Bedriaga [P.].	(Var. *boscæ.*)
38–39.	Serra Estrella.	Dr. H. Gadow [C.].	(Var. *boscæ.*)
40–45.	Valencia.	M. E. Boscá [P.].	(Var. *boscæ.*)

19. *Alytes cisternasii.*

1–4.	Sierra Morena.	M. E. Boscá [P.].

EXPLANATION OF THE PLATES.

Plate XLV.

Fig. 1. *Rana esculenta*, p. 604. Near St. Malo.
2. —— *arvalis*, p. 605. Breslau.
3. —— *temporaria*, p. 606. Near London.
4. —— *græca*, p. 607. Parnassos.
5. —— *iberica*, p. 608. Coimbra.
6. —— *latastii*, p. 608. Italy.
7. —— *agilis*, p. 609. Near St. Malo.

PLATE XLVI.

Fig. 1, 2. *Hyla arborea*, p. 610. Near St. Malo.
3. —— ——, var. *meridionalis*, p. 611. Near Nice.
4. *Bufo vulgaris*, p. 612. Near London.
5. —— *viridis*, p. 612. Breslau.
6. —— *calamita*, p. 614. Near St. Malo.
7. *Pelobates fuscus*, p. 614. Prague.
8. —— *cultripes*, p. 616. Hérault.

PLATE XLVII.

Fig. 1, 2. *Pelodytes punctatus*, p. 617. Near St. Malo.
3. *Discoglossus pictus*, p. 620. Montecristo.
4. *Bombinator igneus*, p. 621. Själland, Denmark.
5. —— *pachypus*, p. 621. Mondorf, Luxemburg.
6. *Alytes obstetricans*, p. 622. St. Germain, near Paris.
7. —— —— var. *boscæ*, p. 624. Serra Estrella.
8. —— *cisternasii*, p. 624. Sierra Morena.

The tadpoles are represented of the natural size. The mouth (*a*) is enlarged 5 diameters in fig. 7, Pl. XLVI.; 15 diameters in figs. 4 and 6, Pl. XLVI., and fig. 3, Pl. XLVII.; 7 diameters in fig. 8, Pl. XLVI., and fig. 6, Pl. XLVII.; 10 diameters in the rest.

December 1, 1891.

Henry Seebohm, Esq., F.Z.S., in the Chair.

Mr. Sclater exhibited a specimen of a Shearwater which had been captured alive in Victoria Park, Sydney, on August 2nd, 1891, having been driven on land by the heavy storm. It had been brought to England from Australia by Prof. Anderson Stuart and was to be deposited in the British Museum. Mr. Sclater read the following extract from a letter from Mr. O. Salvin, F.R.S., concerning the identification of this bird:—

"I have examined the Petrel you sent me. It proves to be a specimen of *Puffinus gavia*, Forst. I have compared it with an example from New Zealand in the Cambridge Museum kindly lent me by Prof. Newton, and find the two birds precisely alike.

"*Puffinus gavia* is not uncommon on the coasts of New Zealand, but it has not to my knowledge been detected near Australia. A full account of the species will be found in Buller's 'Birds of New Zealand,' ed. 2, ii. p. 236."

Dr. Edward Hamilton, F.Z.S., exhibited an example of the Red-breasted Snipe of North America (*Macrorhamphus griseus*) shot near Crinan in Argyllshire, as noticed in the 'Zoologist' for 1891 (Zool. ser. 3, xv. p. 427), and stated to be the second example of this bird procured in Scotland.

Mr. Seebohm exhibited and made remarks on five rare Irish birds from the collection of Mr. R. M. Barrington, of Bray, in County Wicklow. No fewer than four of these had been caught by Mr. W. H. James, the light-keeper at the Tearaght Rock, the most westerly station in Europe. An example of the Mealy Redpoll (*Fringilla linaria*) was caught on the 14th of September, 1890; a Lesser Whitethroat (*Sylvia curruca*) was caught seventeen days later; a Yellow-browed Warbler (*Phylloscopus superciliosus*) after a further interval of fourteen days; and a Red-breasted Flycatcher (*Muscicapa parva*) six days later still. In the meantime, on the 11th of October in the same year, the fifth specimen exhibited had been caught at the Black Rock Lighthouse in County Mayo, and proved to be a Short-toed Lark (*Alauda brachydactyla*).

Mr. W. B. Tegetmeier, F.Z.S., exhibited and made remarks on an abnormal growth of the bill of a Rook (*Corvus frugilegus*), and on the head of a Pheasant with the upper mandible entirely wanting, which had been forwarded to him by Mr. E. L. Layard, F.Z.S.

The following papers were read:—

1. Notes on Transcaspian Reptiles. By G. A. Boulenger.

[Received October 28, 1891.]

Since the publication, in 1888, of Dr. Boettger's excellent account of the herpetological results of the Radde-Walter Expedition to Transcaspia[1], the British Museum has acquired, partly through the kind mediation of Dr. Boettger himself, a large number of Reptiles from the same district, which enable me to supplement the above work and to add six species which have not been recorded before from the Russian Empire. The fact of the occurrence so far west of the Indian species *Eumeces scutatus*, *Lycodon striatus*, and *Dipsas trigonata* is of great interest, as is also the rediscovery of *Ophiomorus brevipes*, hitherto known from a single specimen preserved in the Calcutta Museum.

The material upon which these notes are based consists of the following series:—

1. The first set of duplicates of Dr. Radde's collection, 30 specimens, including types of *Phrynocephalus raddii*, Bttg. Received in 1888.
2. 22 specimens from Ashabad, collected by M. C. Eylandt. Received in 1890.
3. 28 specimens from Ashabad and Tedshen, near Merv. Received in exchange from the Warsaw Museum in 1890.
4. 7 specimens obtained by M. P. A. Warentzoff at Ashabad. Received in 1891.
5. 20 specimens from Bokhara, the Copet Dagh near Ashabad, Achal, and Alexandrowski. Received in exchange from M. P. Nazaroff, 1891.

[1] "Die Reptilien und Batrachier Transkaspiens," Zool. Jahrb. iii. 1888, pp. 871–972, pl. xxxiv.

6. 73 specimens obtained by M. C. Eylandt at Puli Hatun at the confluence of the Geshef-Rud and the Hari-Rud. Received in 1891.

TERATOSCINCUS SCINCUS, Schleg.

I have now six Transcaspian specimens before me, measuring from 40 to 90 millim. from snout to vent: five from Ashabad (Eylandt and one from Puli Hatun. In one of these specimens (from Ashabad) the scales on the back of the head are larger than on the snout, as described by Boettger, the five others having them smaller than on the snout or at any rate not larger. Nostril between the rostral and four nasals; upper nasals in contact with each other behind the rostral in the specimens from Ashabad, separated by one scale in the one from Puli Hatun. Mental as long as broad or longer. 29 to 31 scales round the middle of the body. Head variegated with dark brown; nape and back with black cross-bands, the anterior of which are crescentic.

CROSSOBAMON EVERSMANNI, Wiegm.

This Gecko must be one of the commonest Sand-Lizards in Transcaspia, as every collection made in that district contains numerous specimens. The number of præanal pores varies from six to nine.

GYMNODACTYLUS CASPIUS, Eichw.

The Museum now possesses the following series of specimens, in all of which I have counted the longitudinal rows of ventral scales (V.) and (in the males) the femoro-præanal pores (P.):—

				V.	P.
1.	♂.	Krasnowodsk.	St. Petersburg Mus.	26	29
2.	♂.	Ak-kala, near Astrabad.	,,	26	24
3.	♂.	,, ,,	,,	28	24
4.	♂.	Ashabad.	Eylandt.	26	26
5.	♂.	,,	,,	26	26
6.	♀.	,,	,,	26	
7.	♀.	,,	,,	24	
8.	♂.	,,	Warentzoff.	28	31
9.	♂.	,,	,,	28	28
10.	♀.	,,	Warsaw Mus.	26	
11.	Yg.	,,	,,	26	
12.	♀.	Copet Dagh.	Nazaroff.	28	
13.	♀.	,,	,,	28	
14.	♀.	Bokhara.	,,	30	
15.	♂.	Durun.	Radde.	24	26
16.	♀.	Tachta.	,,	26	
17.	♂.	Puli Hatun.	Eylandt.	26	28
18.	Yg. ♂.	,,	,,	28	29
19.	Yg. ♂.	,,	,,	24	30

Thus we see that the number of scales across the belly varies in these Transcaspian specimens from 24 to 30, and the number of pores from 24 to 31 (34 in one specimen examined by Boettger), thus closely approaching, with respect to these characters, Strauch's *G. fedtschenkoi*, which is described as having 30 to 32 rows of ventrals, and 34 to 37 pores. In fact, one of the specimens (no. 16) in the above list has been referred by Boettger to *G. fedtschenkoi*. As to the other characters taken from the tubercles on the back of the head and body, I find so much variation within certain limits in our specimens, all undoubtedly of one and the same species, that I should have endorsed Boettger's opinion that *G. fedtschenkoi* may after all not be specifically separable from *G. caspius*, if it were not for the recent accession of a specimen from Kelif, Bokhara, which I regard as representing the true *G. fedtschenkoi*.

Gymnodactylus fedtschenkoi, Strauch.

A single specimen from Kelif, Bokhara. Tubercles smaller than in *G. caspius*, more as in *G. scaber*, strongly keeled but not trihedral on the back, where they form 12 series; round and convex, not keeled, on the occiput and temples. 30 scales across the middle of the belly. Although a female, the specimen shows, as mere impressions, a series of 29 femoro-præanal pores.

Eublepharis macularius, Blyth.

I have related (Ann. & Mag. N. H. vi. 1890, p. 352) the curious circumstance under which the presence of this Lizard near Ashabad was ascertained by M. Eylandt.

Eremias guttulata, Licht.

I have examined specimens from the Copet Dagh (Nazaroff) and Puli Hatun (Eylandt). As I have not found specimens of *Lacerta muralis* among the collections made in those localities, it is probable that the Lizards mentioned by Boettger (*l. c.* p. 907) as having been seen, but not captured, by Walter on the northern slope of the Copet Dagh belonged to *Eremias guttulata*.

Eumeces scutatus, Theobald.

This Scink was known from Sind, Cutch, the Punjab, and Cashmere. Its discovery by M. Eylandt so far west as Puli Hatun is therefore of considerable importance. All the 15 specimens examined have 21 scales round the middle of the body and two azygous postmentals; in one specimen the frontoparietals form a very short median suture, in the others the frontal is in contact with the interparietal. Pale brown or olive-grey above, white beneath; the small specimens have three darker longitudinal bands and are spotted with black, the black spots being crowded and intermixed with white ones on the lateral bands; upper surfaces and sides of tail with black spots very regularly disposed, a spot occupying every other scale in each longitudinal series. These markings may almost completely disappear in the adult. The largest specimen measures 300 millim., the tail entering for 180.

E. scutatus occurs at Puli Hatun in company with *E. schneideri*, both species being well represented in M. Eylandt's collection.

OPHIOMOROUS BREVIPES, Blanf.

This species, the type of Blanford's genus *Zygnopsis* or *Zygnidopsis*, was established upon a single specimen, with the head slightly injured, obtained at Sáadatabád, a village about 100 miles south-west of Karman, on the road to Shiraz; this specimen, figured in the 'Zoology of Eastern Persia,' pl. vii. fig. 4, is preserved in the Calcutta Museum. In 1879, two specimens from the Southern Coast of Persia or Baluchistan were referred by Blanford to the same species [1]. A few years later, when preparing the Catalogue of Lizards, I came to the conclusion that the latter specimens belong to a species distinct from *O. brevipes*, for which I proposed the name of *O. blanfordii*, and this view is now fully confirmed on the rediscovery, at Puli Hatun, of the true *O. brevipes*. 10 specimens were sent by M. Eylandt. They differ at first sight from *O. blanfordii* in the less depressed, more conical snout, and the somewhat larger eye; they further differ in having 22 scales round the body instead of 20, and the interparietal as broad as long instead of longer than broad. Nostril nearer the rostral than to the anterior loreal; frontonasal two fifths to one half the length of the frontal, which is a little longer than broad; usually, only the first supraocular forms a suture with the præfrontal, but sometimes the second also, as in *O. blanfordii*; interparietal as long as broad or a little broader; a pair of enlarged nuchals may be present; fifth upper labial largest; two azygous postmentals. Length of hind limb $3\frac{2}{3}$ to $4\frac{2}{3}$ times in the distance between the shoulder and the thigh.

Coloration as described and figured by Blanford. The largest specimen measures 95 millim. from snout to vent.

ERYX JACULUS, L.

All the specimens I have examined fall into Boettger's var. *miliaris*, Pall., and I record the following numbers from four specimens in the British Museum. Under *a* is given the number of scales from eye to eye, *b* from eye to nasal, *c* round the eye, *d* upper labials, *e* across middle of body, *f* ventrals, *g* subcaudals.

	a.	*b.*	*c.*	*d.*	*e.*	*f.*	*g.*
1. Ashabad (*Radde*)	7	4	13	13	45	185	23
2. „ (*Eylandt*)......	7	4	12–13	12	45	179	24
3. „ (*Warsaw Mus.*)	8	5	13–14	14	49	180	27
4. Puli Hatun (*Eylandt*) .	9	4	13	12	47	188	21

I find the following numbers in three specimens from E. Turkestan :—

Ilisk (*Lansdell*)	8	4	11	11	45	183	21
	9	4	12–11	11–10	43	185	20
	9	3–4	10	10–11	45	172	20

LYCODON STRIATUS, Shaw.

A perfectly typical example, with 177 ventrals and 66 subcaudals, from Puli Hatun, extends to Transcaspia the range of this common

[1] Both are now in the British Museum, thanks to Mr. Blanford's generosity.

Indian Snake, which is known from Sind, the Punjab, the North-Western Provinces, and the hills below Simla to Southern India[1].

PSEUDOCYCLOPHIS WALTERI, Bttg.

Since the description of this species by Boettger in 1888, from a single specimen obtained by Dr. Walter in Transcaspia, close to the North-eastern limit of Persia, I have examined a second specimen found in Sind by Mr. Blanford. Quite recently the British Museum has received, through M. Warentzoff, a half-grown specimen, from Ashabad. It has 235 ventrals and 73 subcaudals. Loreal absent. The upper surface of the head, behind the snout, and the nape blackish; the blackish cross-bars or transverse series of spots well marked on the whole body, but absent from the tail.

ZAMENIS RHODORHACHIS, Jan.

This species may be added to the list of Transcaspian Reptiles, as M. Zaroudnoi's notes[2] on a dark grey Snake with a bright red vertebral stripe, seen by him at Gjarmaou, Ashabad, Merv, and Tedshen, evidently refer to it. I may add that I now regard *Z. rhodorhachis* (= *Gonyosoma dorsale*, And.) and *Z. ladacensis* as colour varieties of one and the same species, which is perfectly separable from both *Z. ventrimaculatus* and *Z. karelinii*. The South-western Asian species of *Zamenis* may be distinguished as follows:—

A. Scales in 17 rows, smooth; posterior chin-shields in contact with each other .... 1. *Z. mucosus*, L.

B. Scales in 19 (exceptionally 17) rows, smooth; posterior chin-shields separated from each other by scales.

- *a.* Frontal not or but slightly wider than the supraocular, more than once and a half as long as broad.
  - Ventrals rather indistinctly angulate laterally; scales with two apical pits .... 2. *Z. gemonensis*, Laur.
  - Ventrals very distinctly angulate laterally; scales with a single apical pit .... 3. *Z. dahlii*, Fitz.
- *b.* Frontal anteriorly considerably wider than the supraocular.
  - *α.* Nine upper labials, two of which enter the eye.
    - Ventrals 214–255; subcaudals 124–145... 4. *Z. rhodorhachis*, Jan.
    - Ventrals 199–211; subcaudals 82–99 ...... 5. *Z. ventrimaculatus*, Gray.
  - *β.* Nine upper labials; a subocular separates the eye from the sixth labial.............. 6. *Z. karelinii*, Strauch.
  - *γ.* Eight upper labials .... 7. *Z. elegantissimus*, Gthr.

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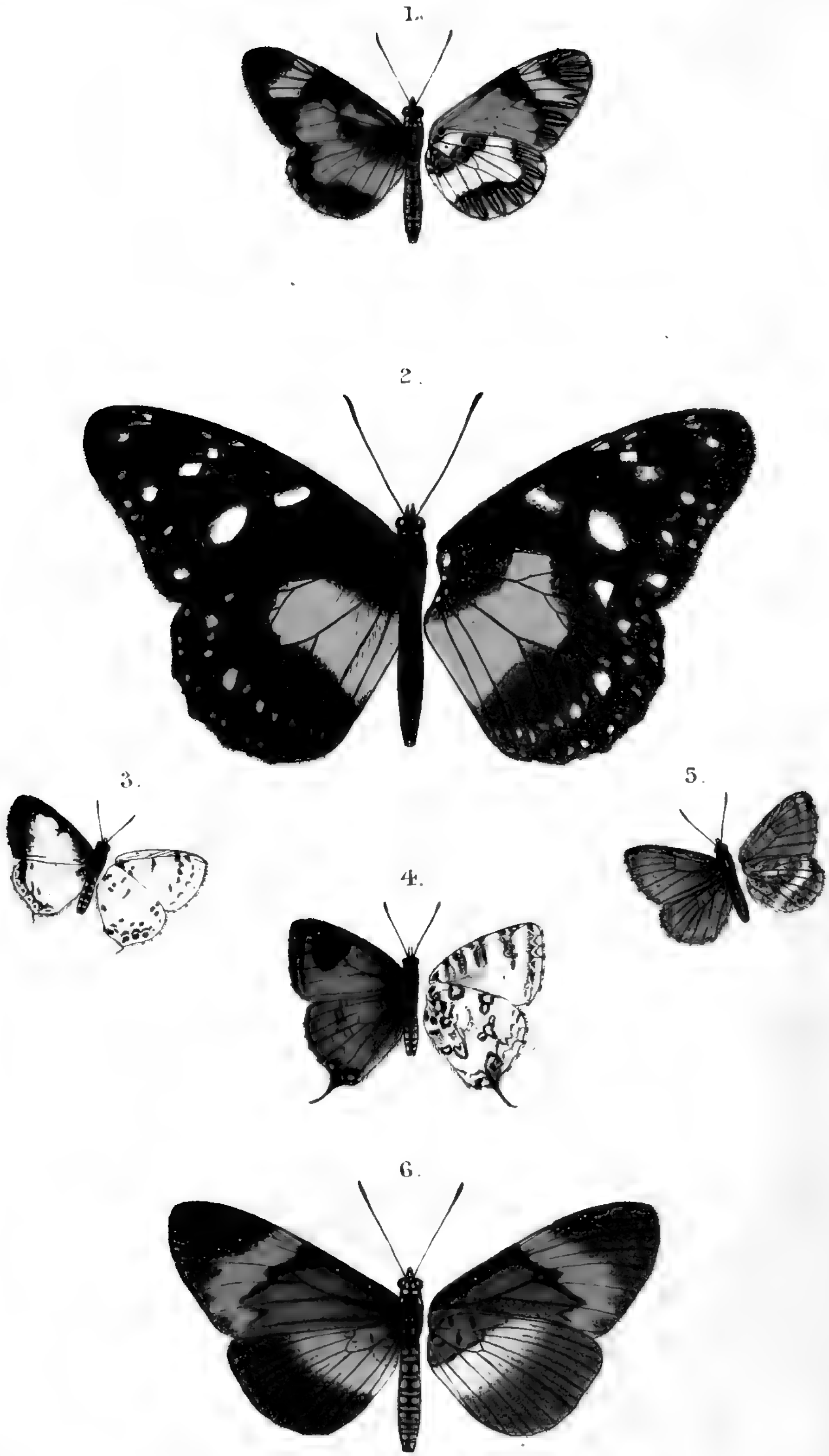
[1] In a recent paper on Indian Snakes (Journ. As. Soc. Beng. lx. 1891, p. 233), Mr. W. L. Sclater expresses doubts as to the existence of this Snake in Southern India, its resemblance to *L. travancoricus*, Bedd., rendering, in his opinion, confusion of the two by no means impossible. I therefore seize this opportunity to state that several specimens, collected by Col. Beddome in Wynaad and the Anamallays, are in the British Museum. In addition to the characters I have previously indicated, *L. striatus* differs from *L. travancoricus* in having the loreal shield in contact with the internasal, as in *L. aulicus* and *L. anamallensis*.

[2] Bull. Soc. Nat. Mosc. 1890, p. 291.



M. Horman-Fisher del. et lith.

Mintern Bros. Chromo. lith.

NEW BUTTERFLIES FROM BRITISH EAST AFRICA.

C. Scales in 21 rows or more, more or less distinctly keeled.
- Scales in 21 (rarely 23) rows; nine or ten upper labials, fifth and sixth entering the eye .... 8. *Z. ravergieri*, Mén.
- Scales in 23 or 25 rows; nine or ten upper labials, fifth (rarely fifth and sixth) entering the eye .... 9. *Z. nummifer*, Reuss.
- Scales in 25 to 33 rows; ten to thirteen upper labials, none entering the eye 10. *Z. diadema*, Schleg.

D. Scales in 41 to 43 rows, smooth; 14 or 15 upper labials, none entering the eye .... 11. *Z. microlepis*, Jan.

Z. nummifer, Reuss (*neglectus*, Jan), should perhaps be regarded as a variety of ***Z. ravergieri***, Mén. (*caudælineatus*, Gthr., *fedtschenkoi*, Strauch), rather than as a distinct species. In addition to the characters mentioned above, it differs in having the upper portion of the præocular smaller and the anterior pair of temporals more enlarged.

DIPSAS TRIGONATA, Schn.

Another well-known Indian Snake to add to the fauna of Transcaspia. A fine specimen is in M. Eylandt's collection from Puli Hatun.

2. Descriptions of New Butterflies collected by Mr. F. J. Jackson, F.Z.S., in British East Africa, during his recent Expedition.—Part II.[1] By EMILY MARY SHARPE.

[Received October 30, 1891.]

(Plate XLVIII.)

Fam. NYMPHALIDÆ.

Subfam. DANAINÆ.

Genus AMAURIS.

AMAURIS JACKSONI, sp. n. (Plate XLVIII. fig. 2.)

Intermediate between *A. echeria*, Stoll, and *A. lobengula*, E. M. Sharpe; but is easily distinguished from both these species by the great difference in the markings of the hind wing.

Fore wing. Dark brown or nearly black, relieved by white spots placed exactly in the same position as in *A. lobengula*, but all the spots are pure white instead of yellow. An oblong white spot in the middle of the discoidal cell; an ovate spot below the cell between the first and second median nervules, and a very small one near the posterior angle, between the submedian nervure and the first median nervule; this spot is the commencement of a row of four spots extending to the apex, the second spot being the smallest and placed between the first and second median nervules, the third one just above, and the fourth spot between the first radial or discoidal

[1] See P. Z. S. 1891, p. 187.

nervule and the fifth subcostal nervule; close to the hind margin are three minute spots, one just below the second median nervule, and the two others above the latter, placed closed together, between the second and first median nervules; two spots above the end of the discoidal cell varying in size; three small spots on the costal margin placed somewhat apart from each other, the third one being near the apex, and having a small triangular-shaped spot placed in the fork of the fourth and fifth subcostal nervules, just below the costal spot.

Hind wing. In colour and markings resembling *A. lobengula*, except as regards the ochre patch, which is of the same shape as in *A. echeria.* The brown border is very broad, and is relieved by two rows of spots varying very much in size and all entirely of a yellow colour, the first row close to the hind margin consisting of small twin spots placed between the nervules, the second row having the sixth spot from the costa (below the third median nervule) the largest, the ninth ending just above the first median nervule. The transverse band of ochre is very deep in colour and somewhat wider than in *A. echeria*, and is covered with black hairs near the inner margin.

Base of wing dark brown.

Underside resembling that of *A. lobengula* very closely, the general colour being rather darker than in either this species or *A. echeria.* The white spots are all very distinct, but vary somewhat in size.

Expanse $3\frac{1}{2}$ inches.

Hab. Sotik, Kavirondo, Sept. 1889.

Subfam. ACRÆINÆ.

Genus ACRÆA.

ACRÆA SOTIKENSIS, sp. n. (Plate XLVIII. fig. 1.)

Allied to *A. bonasia*, Fabr., but is easily distinguished by the pale yellow patch near the apex of the fore wing, and by the transverse band on the hind wing inclining to pale yellow towards the inner margin.

Fore wing. Costa, apex, hind margin, and base of wing along the inner margin to about the middle of the wing deep velvety black. A streak of rufous on the lower half of the discoidal cell; this streak is inclined to break through the black band which crosses the wing near the end of the discoidal cell, as in *A. bonasia*; the patch of orange-yellow wider, and the pale yellow patch near the apex is much larger than in the latter species.

Hind wing. Base black; the orange transverse band rather wider, fading to pale yellow about the middle of the wing, continuing to the inner margin and becoming gradually narrower. The hind marginal border is slightly narrower as far as the third median nervule, when it becomes wider than in *A. bonasia.* This border is relieved by five minute triangular-shaped spots of orange-yellow, between each nervule, terminating above the first median nervule.

Underside.—Fore wing. Basal area rufous, paler along the inner margin, the patch of orange on the upperside being decidedly lighter below. Costa black as far as the apical patch above the discoidal cell, which then becomes more indistinct and very much dentated towards the inner margin. The hind margin is edged with a narrow border of orange-yellow which extends in thin rays between the nervules, each nervule being distinctly marked with black, and having a black ground with a line of yellow on either side of the nervules.

Hind wing. Base of wing yellow, with a narrow transverse band of deep rufous extending from the costa to the inner margin and spreading up to the base. This transverse band is outlined on either side with small black spots, which become more numerous at the inner margin. Middle portion of wing pale yellow, followed by a submarginal border of eight nervules, black, with a streak of yellow on both sides and then outlined with black. Between each of these nervules is a streak of orange-yellow; also at the very edge of the wing are seven triangular-shaped spots of pale yellow, the last spot (counting from the costa) being the smallest.

Expanse 1·8 inch.

Hab. Sotik, Kavirondo, Oct. 1889.

Genus Planema.

Planema latifasciata, sp. n. (Plate XLVIII. fig. 6.)

Nearest to *P. euryta*, Linn., but is easily distinguished by the deep chestnut-colour at the base of the fore wing and by being so much smaller in size.

Fore wing. Base and greater part of basal area deep rufous brown or chestnut, edged with a narrow outline of black, which is very strongly dentated below the discoidal cell, becoming almost invisible towards the inner margin. Across the middle of the wing is a band of deep orange-yellow, much dentated externally on the first, second, and third median nervules; this band becoming much narrower at the inner margin. A large portion of the apex black or very dark brown, which colour continues along the hind margin, though decreasing very much in width towards the inner margin.

Hind wing. Rufous base much more restricted than in the fore wing, though somewhat lighter than in the latter. A transverse band of pale cream-colour or yellow crosses the middle of the wing, increasing slightly in width to the inner margin. This band is followed by a very broad border of black or deep brown along the hind margin, this colour extending along the nervules, while there are also internervular rays of the same colour reaching to about the middle of the transverse band. There are a few black spots at the base.

Underside. Very similar to the upperside, though the fore wing is much lighter in colour.

Hind wing. Base as dark as that in the fore wing, having two small black spots above the cell, one in the middle, and a streak or comma close to the end of the latter; two very minute black spots above the first radial and second subcostal nervules, two black spots below the cell corresponding to those above the cell, and two very minute black spots below the internal nervure. Transverse band white, followed by the same broad border of light brown on the hind margin as on the upperside. The nervules and internervular markings are somewhat darker.

Thorax black, with a row of white spots; body black, with narrow lines of yellow marking the joints, and with large oval-shaped spots of the same colour on each side. Underside of body entirely yellow.

Expanse $2\frac{1}{2}$ inches.

Hab. Mount Elgon, Feb. 1890.

Fam. LYCÆNIDÆ.

Genus CASTALIUS.

CASTALIUS MARGARITACEUS, sp. n. (Plate XLVIII. fig. 3.)

Intermediate between *C. carana*, Hew., and *C. lactinatus*, Butler.

Fore wing. Creamy white; the base, costa, apex, and hind margin broadly marked with black, with no indication of white near the apex as in *C. carana*. A small streak of black extends from the costal margin along the end of the discoidal cell.

Hind wing. Closely resembling that of *C. lactinatus*. The submarginal black border consisting of six white spots with black ocelli, each separated by the black nervules; these spots are rather pointed towards the base. There are a few black spots beyond this border, and a slight shading of black at the base.

Underside. Differs very much from that of either species.

Fore wing. With a black streak close to the base, followed by two small black spots, one above and the second below the median nervure; a minute spot and streak at the end of the discoidal cell; two submarginal rows of black spots, commencing from the costal margin and gradually uniting above the submedian nervure. The row of white subovate spots is very distinct, each having a small black centre.

Hind wing. Similar to the fore wing, but having a few more spots near the base; the black streak at the end of the cell is visible as in the fore wing, also the two submarginal rows of black spots, though more broken, and the subovate spots of white have larger centres with silvery-green ocelli.

Expanse 1 inch.

Hab. Sotik, Kavirondo, Sept. 1889.

Genus HYREUS.

HYREUS CORDATUS, sp. n. (Plate XLVIII. fig. 4.)

Nearest to *H. juba*, Fabr., but at once distinguished by the heart-shaped patch of black velvet near the apex.

Fore wing. Brown tinged with bronze, and with faint blushes of bright violet. Near the apical portion of the wing a large heart-shaped patch of velvety black. Cilia brown, alternately marked with white, but not very distinctly.

Hind wing. Similar to the fore wing, slightly darker at the base. The first median nervule terminates with a fairly long tail, having on either side a bright green ocellus edged round with black, the second one being the smaller of the two and terminating at the end of the submedian nervure. Cilia similar to the fore wing but much more distinct.

Underside very distinct from that of *H. juba.*

Fore wing. Ground-colour pearly white; the basal area, especially just below the discoidal cell, shaded with light brown. Costal margin alternately marked with brownish black, which extends through the cell to the median nervure in bars; near the apical portion is another black bar, separated at the costal margin by a spot of white, which decreases in width to the second median nervule. The submarginal border is black, having a thin white line much dentated, then another edging of black not so distinct, and also six white spots, those near the apex being more distinct and separated from each other by the nervules. Cilia much more distinct than on the upperside.

Hind wing. White, with numerous spots and markings near the base, which become thicker towards the inner margin; the end of the cell is marked by an outline of black. Near the costa, about the middle of the wing, is a round spot of black with a large white centre, and at the end of the costal nervure is a figure of 8 outlined with black and having white centres. Straight from the end of the cell and situated some little way off is a spot, very much pointed towards the hind margin, with two smaller spots, one on either side, all outlined with black, leaving the centres white. Near the hind margin is a submarginal border of white, very finely edged with black lines on the upper and lower sides, leaving white centres which are rather dentated towards the base. Between the first and second median nervules the black is much more distinct, and is relieved by a minute black spot, edged on either side by small specks of brilliant emerald-green, which become of a reddish bronze on the side close to the cilia; there is another spot of the same description, but with less green, between the submedian nervure and the first median nervule; this spot is also rather smaller than the other. Cilia nearly all white.

Expanse 1·4 inch.

Hab. Sotik, Kavirondo, Sept. 1889.

Genus Lycæna.

Lycæna æquatorialis, sp. n. (Plate XLVIII. fig. 5.)

Allied to *L. palemon,* Cram., but easily distinguished by the different shade of blue on the wings, this blue colour being brighter and more distinct than in the species referred to.

Fore wing. Cilia distinctly marked alternately with white and brown; a narrow border of brown on the hind margin extending from the inner margin to the apex, this border being broader than in *L. palemon*; the costa very slightly edged with brown, which is more distinct towards the base of the wing. The rest of the wing blue.

Hind wing. Similar to the fore wing, but differing from *L. palemon* in that the hind wing of the latter has a distinct little tail, whereas *L. æquatorialis* seems to lack this character entirely.

Underside.—Fore wing light brown, with a slight indication of the markings as in *L. palemon.* Near the apex one small white spot.

Hind wing. Light brown relieved by white bands; hind marginal border brown with a very minute ocellus, black, edged with a faint tinge of yellow on the upper portion, with a tiny speck of green below. This small ocellus is placed between the first and second submedian nervules; the brown border is followed by a transverse band of white commencing narrowly at the costa, widening in the middle, and again decreasing towards the inner margin. About the middle of the wing is a band of dark brown as in *L. palemon,* the only difference being that the wide part extends towards the base instead of proceeding towards the hind margin. Two streaks of white follow, varying very much in size, and with a short bar of brown edged with white; the base is black, dusted with light brown, almost yellow.

Expanse 1·1 inch.

Hab. Mount Elgon, 8500 feet, Feb. 19, 1890.

EXPLANATION OF PLATE XLVIII.

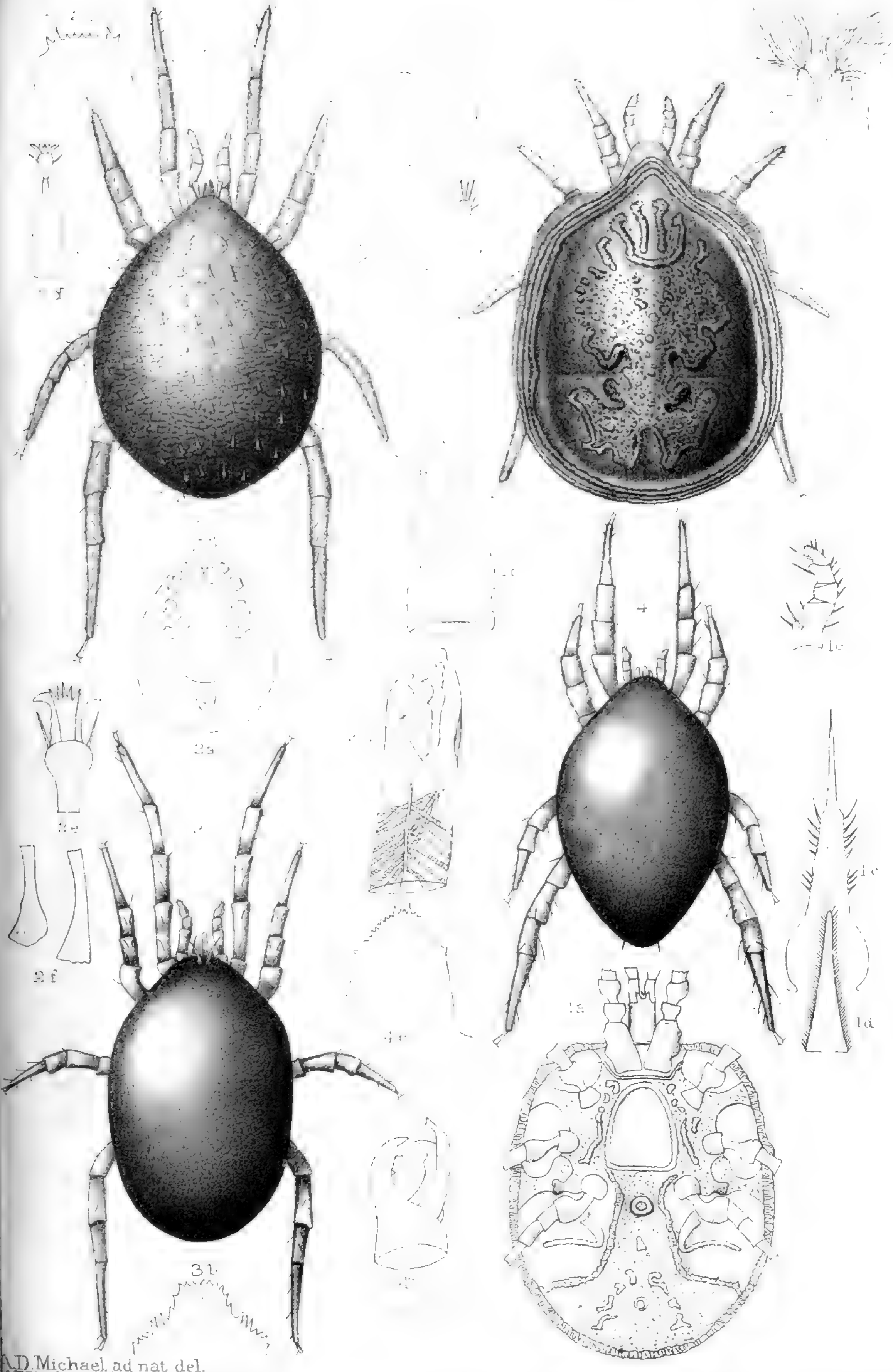
Fig. 1. *Acræa sotikensis,* p. 634.
2. *Amauris jacksoni,* p. 633.
3. *Castalius margaritaceus,* p. 636.
4. *Hyreus cordatus,* p. 636.
5. *Lycæna æquatorialis,* p. 637.
6. *Planema latifasciata,* p. 635.

3. On the Association of Gamasids with Ants. By A. D. Michael, F.L.S., F.Z.S., F.R.M.S., &c.

[Received November 10, 1891.]

(Plates XLIX. & L.)

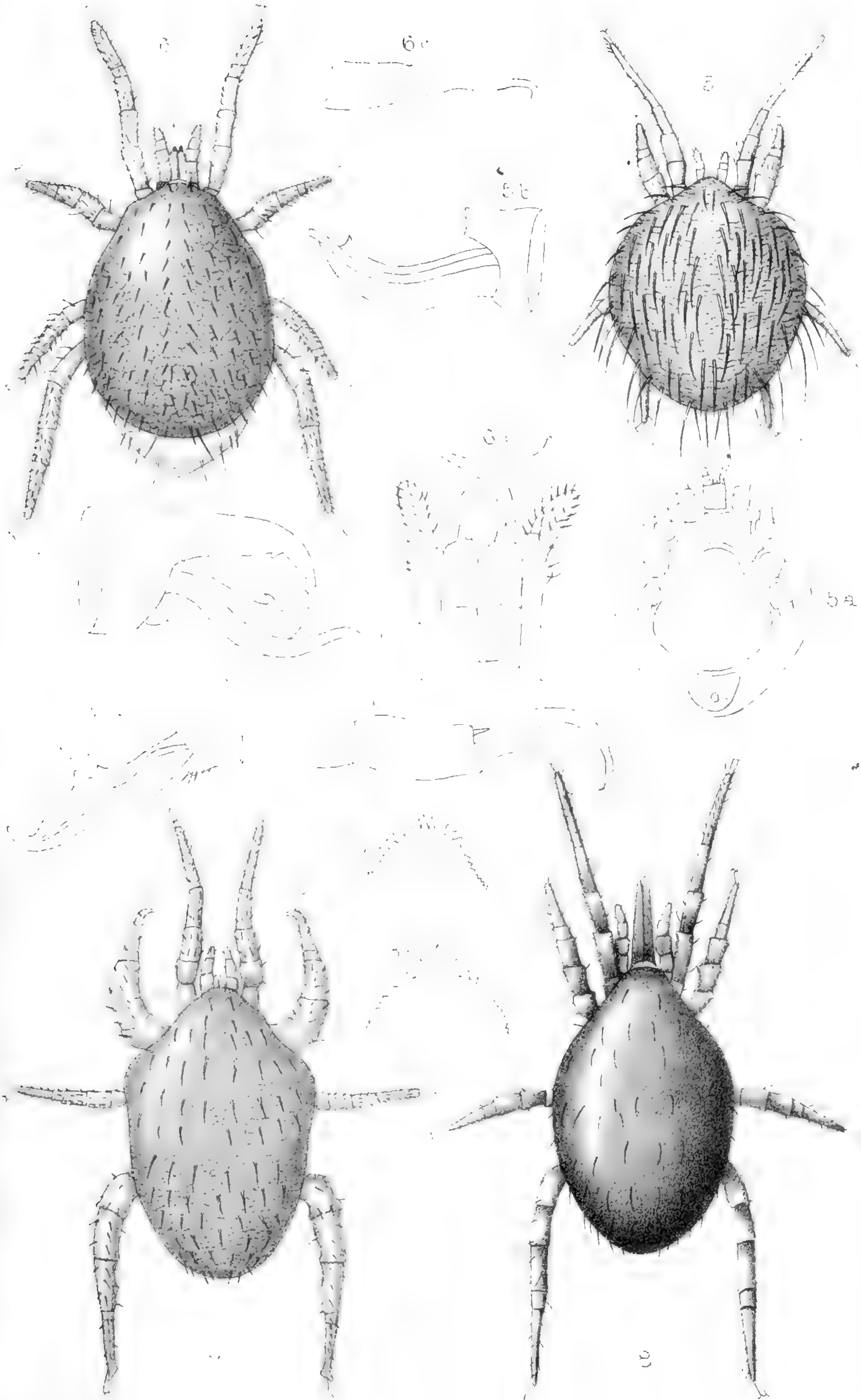
This paper records some observations made during the present year (1891), chiefly near Ajaccio in Corsica and near Innsbruck in Tyrol. In the former locality the Ants' nests examined were at a level of not more than 500 feet above the sea; those in the Tyrol were at levels varying from about 3000 to over 4000 feet above the sea. In both places I had the great advantage of the company of Mr. E. Bostock of Stone, and in the latter also of my cousin Mr. M. J. Michael. Both these gentlemen are excellent collectors, and the search for specimens and finding of new species must be



A.D. Michael ad nat. del.
M. P. Parker lith.

West, Newman, imp.

Gamasidæ from Ants' nests.



A. D. Michael ad nat. del.
M. P. Parker lith.

West, Newman imp.

Gamasidæ from Ants' nests.

considered joint work; the observations and experiments were solely my own, and I alone am responsible for any opinions expressed in this memoir.

For the identification of the species of Ants I am indebted to the kindness of Mr. Edward Saunders.

The *Gamasidæ* are a family of the Acarina; Mégnin[1] considers them to be the most highly organized in the order and the nearest to the Insecta; in spite of the absence of eyes, which are found in some other families, the great development of the brain and nervous system, and the specialization of the trophi and the alimentary and muscular organs, probably entitle them to this position.

The family may be divided into four well-marked subfamilies, viz. the *Pteroptinæ*, the *Dermanyssinæ*, the *Uropodinæ*, and the *Gamasinæ*—the last-named being far the largest. The *Pteroptinæ* are all parasites of Bats, the *Dermanyssinæ* of Birds or Bats; these two subfamilies may be wholly omitted from consideration for the purposes of this paper; it is amongst the *Uropodinæ* and *Gamasinæ* alone that the facts here recorded arise. Both these families are composed of creatures which in their immature stages are soft and white, but in their mature condition are fully chitinized. In the former group the chitin is very dense and hard, in the latter much thinner and tougher; the former are mostly rather slow and inactive, the latter usually extremely quick and active. It used to be considered that the *Gamasinæ* lived wholly on vegetable matter in a decaying condition; in the year 1880, however, when I was trying to rear a few of the species in confinement for the purpose of tracing their life-histories, I entirely failed in getting them to live upon vegetable matter, and thinking from the structure of their mouth-organs that they must be predatory, I tried them with a diet of living cheese-mites, upon which they throve admirably[2]. I have since usually fed them in this manner, or at all events with small Acari or Insects. Col. Blathwayt also, who has made numerous experiments upon rearing them, has adopted my mode of feeding, apparently with complete success, he also having failed with a vegetable diet[3]. It is evident therefore that some species of *Gamasinæ*, probably not all, are predatory. As to the food of the *Uropodinæ*, I do not think that we have any reliable information as yet: their extremely long and slender mandibles with minute chelæ seem as though intended for introduction into very narrow passages; their slowness hardly seems fitted for a predatory life, as they certainly do not construct any snare, and I have entirely failed to rear them, and so I believe has Col. Blathwayt[4].

[1] "Mémoire sur l'organisation et la distribution zoologique des Acariens de la famille des Gamasidés." 'Robin's Journ. de l'anat. et de la physiol.,' May 1876, pp. 298–9.

[2] "Observations on the Life-histories of Gamasinæ," Journ. Linn. Soc., Zool. vol. xv. (1881) p. 298.

[3] "On some common Species of Gamasidæ," Journ. of Microsc. and Nat. Sci. n. ser. vol. ii. 1889, p. 102.

[4] It is easy to rear the creatures in large jars containing quantities of material, but then they are useless for observation.

The numbers of Aphidæ, Coleoptera, and indeed of other insects which are commonly found in Ants' nests are too well known to require any reference by me; but the observations on the presence of Acari in a similar situation are, as far as I know, very few. Forel in his great work 'Les Fourmis de la Suisse,' published in 1874, speaking of Myrmecophilous insects (p. 424), says:—"Acarina appear to enjoy a certain immunity; they run about amongst the ants without exciting their anger; it is rare to see them attach themselves to the bodies of their hosts or to those of the larvæ or nymphs. I have nevertheless observed the fact many times, and as it is the mode of life of most Acari we may probably consider it as general in this instance also. Moreover, living in the nest the Acari do not risk anything in releasing one ant, because they can find as many others as they wish." This is, I believe, his only notice of the subject. It will be seen that Forel does not say what Acari he is talking about, and they are almost as various as the different groups of the Insecta; he also falls into the very general, but by no means correct, view of supposing that the great bulk of the Acarina are parasitic, whereas in fact probably not half the species are ever parasitic, and amongst those that sometimes are so by far the larger proportion are only parasitic in an immature stage, not when adult; and among these a very large number only use their host as a means of conveyance, and are not parasitic in any other sense.

The first notice, which I am aware of, specially connecting any Gamasids with Ants is that of Haller in 1877[1], who describes a species which he makes the type of a new genus and which he received from Dr. Uhlmann, who found it, apparently near Munich, parasitic upon (auf) *Formica nigra*. Haller does not state, and probably did not know, the extent of the parasitism; he had a dozen specimens. At the end of his description Haller says "Parasitic upon Insects, especially Ants;" he does not, however, give any reason why he believes it to be parasitic on anything except *Formica nigra*. This remained the only species of the genus until 1888, when Prof. Berlese described two new species found by A. Balzan[2]. One from Brazil, called "*caput-carabi*," in spite of its name, is not stated to have been found on any insect; but is so called because the whole mite is supposed to resemble the head of a *Carabus*; the other, *viduus*, was found upon a Beetle of the genus *Scarites*.

The next notice is that of Sir John Lubbock, who in 1881 found a very curious *Uropoda* in the nests of *Lasius flavus*; he obtained several specimens, and informed me that it was not uncommon in the nest of that species of Ant. It was called *Uropoda formicariæ*[3].

The only other record which I know of refers to one of the species dealt with in this paper, which was unknown when I started

[1] "*Antenophorus uhlmanni*, ein neuer Gamaside," Archiv für Naturgesch. Hft. xliii. p. 57.

[2] "Acari Austro-Americani quos collegit Aloysius Balzan," Bull. Soc. Ent. Ital. 1888.

[3] "Observations on Ants, Bees, and Wasps.—Part VIII.," Journ. Linn. Soc., Zool. vol. xv. (1881) p. 386.

upon my journey, but on my return I found that during my absence Prof. Berlese had described it from specimens he found near Naples. He says "frequently found in Ants' nests," but does not say anything as to the species of Ant or whether found in the nests of more than one species; he calls it *Uropoda canestriana*[1].

I spent the month of April (1891) in Corsica. Above Ajaccio, almost adjoining the top of the garden of the Hôtel Continental, is a little sheltered plain of sandy earth and rock, with scattered bushes and a great number of large, loose stones. On turning these stones over, the larger number are found to cover the nests of some Ant; one of those most frequently found in this locality is the small yellow *Tetramorium cæspitum*, race *meridionale*, Emery, which differs widely from the ordinary type of that species. On examining the nests of this Ant with a lens, I at once noticed some reddish-orange spots, which I at first thought might be Sir John Lubbock's *Uropoda formicariæ*. Placing them under the microscope I found them to be an allied but different and much smaller species, then unknown to me; but which, as above stated, Prof. Berlese had lately found and called after Prof. Canestrini. The *Uropodæ* were on the undersides of the stones and in the passages and chambers of the nest, never, as far as I saw, upon the Ants themselves; they were, as is usual, rather inactive creatures, and did not appear to take much notice of the Ants, nor did the Ants of them. It was not every nest of *T. cæspitum* that contained the *Uropodæ*, but I should think half did; and although not very abundant they were fairly numerous in those nests where they did occur. They were of both sexes and of all ages. I did not find this *Uropoda* in the nest of any Ant except *T. cæspitum*, nor have I ever found it anywhere except in the nests of the Ant.

In the nests of the same species of Ant at the same place we found one of the *Gamasinæ* belonging to the genus *Lælaps*, which I believe to be unrecorded and propose to name *L. equitans*; it is sub-discoidal in form, very small, and is an active, wandering creature, entirely different from the *Uropoda*. It was found, like the *Uropoda*, upon the underside of the covering-stones, and in the passages and chambers of the nest; but it was also found on the Ants themselves, most frequently sitting quietly upon the broad head of the Ant. It did not appear at all like a creature which was permanently resident upon the Ant, but rather like one which was enjoying a short temporary ride; it jumped on to and off the Ant with great activity, and several times when the nest was disturbed or when I thought I was going to catch the *Lælaps* it jumped neatly on to the head of an Ant, which ran off and was immediately lost amongst the swarms of others. The Ant never seemed to be at all inconvenienced by its rider, and never made any effort to get rid of it, but appeared to me to go on contentedly carrying it as long as the *Lælaps* chose to stay. This mounting and riding upon the Ants seemed to me very characteristic of the Gamasid, and I have utilized it for the specific name. The *Lælaps*

[1] "Acari, Scorpioni e Miriapodi Italiani." Florence, fasc. lviii. pl. iv.

was fairly common in the nests of *T. cæspitum,* but I never met with it elsewhere.

These were the only Gamasids which we found in the nests of *T. cæspitum.*

Another Ant whose nests were very common under the stones in the same place was *Aphænogaster testaceopitosa,* a somewhat larger and almost black species. In its nest we found another *Lælaps,* which I believe to be unrecorded and propose to call *L. myrmophila*; this also is an active Arachnid, but its activity is not shown in springing on the Ant, I never saw one upon an Ant during all my searches: on the other hand, the Ant seemed to take considerable notice of the mite, and when the nest was disturbed I frequently saw the former pick up the latter in its mouth and carry it off to a place of safety, just as it did with its own pupæ and larvæ, and as Ants are said to do with some of the beetles which frequent their nests. This Gamasid was tolerably common in the nests of the *Aphænogaster,* but I did not ever capture it elsewhere. So strictly were the three species found in Corsica confined to the nests of the respective Ants that when I saw the species of Ant I could tell at once what Gamasids I was going to find. I did not see any species except *L. myrmophila* in the nests of the *Aphænogaster,* nor did I obtain any Gamasids from the nests of such other species of Ants as I was able to search in Corsica.

After leaving Corsica I crossed Italy and spent the summer at Igls, a small village about 1100 feet above Innsbruck. The slopes of the Patcherkofl, upon which the hamlet stands, are clothed with pine and fir woods; and amongst them ants' nests abound. I had considerable opportunities of searching them; I, however, did not find there the same species of Ants as in Corsica, nor did I see any specimen of either of the three Gamasids which had inhabited their nests; on the other hand, we did find other Gamasids in the nests of other Ants.

In the first place, Mr. M. J. Michael brought in some specimens of a largish Gamasid which he had found in the nest of some ants in the ground; this creature also seems to be unrecorded, and I propose calling it *Lælaps lævis.* Unfortunately my cousin, expecting to find plenty more, did not secure specimens of the Ant; so that I cannot say what species it associates with, for we were not successful in finding it again. I therefore only know that it was found in an ants' nest and that it does not appear to have been found elsewhere.

One of the commonest Ants was *Camponotus herculeanus,* a large species which amongst other habitats seems specially partial to the stumps of pine-trees which are left in the ground after the trees have been felled. These stumps, both above and under ground, are constantly riddled by the passages and chambers of the Ants, and such nests, which I believe were made by race *ligniperdus* of the Ant, proved perfect store-houses of Gamasids: not that every nest contained Gamasids, far from it; in many nests I could not find one; but in a considerable proportion of them the Arachnids were present in substantial numbers, although not usually in great abundance, all of them belonging to one of the same two genera, viz. *Lælaps* or *Uropoda*, and, as far as I have been able to ascertain, none of them are yet known to science. The most frequent and the most conspicuous of the former genus was a pyriform species which had its dorsal surface dotted at almost regular intervals with wedge-shaped hairs, which give it rather an exceptional appearance; I propose calling it *L. cuneifer*. This Acarus was found chiefly deep in the interior of the nest, on the sides and roofs of the passages and chambers, where they were damp without being wet, although sometimes in dry parts, but never in any instance did I find this *Lælaps* on the Ants themselves. The *Lælaps* were of both sexes and in all stages; but even the immature stages of the mite were always on the wood, never on the Ant; yet I never found a specimen except in the Ants' nests. The same remarks will apply to all the Gamasids of the genus *Lælaps* which I found in the nests of the *Camponotus*.

I thought that this species would be a favourable one to experiment upon, in order to see if I could obtain any idea of the object for which the Gamasid was present in the Ants' nest. In these *Gamasinæ*, when the dorsal chitin is thin, as in this species, the principal portions of the alimentary canal, consisting chiefly of the small ventriculus and its four great cæca, can be plainly seen through the dorsal surface as dark objects when they are full of food; if, however, they are empty they usually become invisible. I collected several suitable specimens of the Gamasid and placed them in the cells which I had formerly used with success in rearing *Gamasidæ* under observation to trace their life-histories—viz. glass rings cemented on to an ordinary 3×1 inch microscopic glass-slip, and with the bottom of the cell thus formed lined with blotting-paper, which is kept moist, and a few pieces of suitable sterilized débris placed in the cell; the whole is then covered with a second glass-slip, and two elastic bands or a clip added to hold all together. The Gamasids were healthy when I put them in and their alimentary canals were full of food; I placed some living Ants with them and kept them supplied with living Ants only. The alimentary canals of the Gamasids soon ceased to contain food, and were not replenished, while the creatures themselves became weak and unhealthy. I changed my Gamasids, but with similar results. I then tried eggs, larvæ, and pupæ of the Ants; but in no case, as far as I could see, did the Gamasids touch them, and their alimentary canals became or remained empty as in the former case. This probably was only what might have been expected, as the Ants would hardly have tolerated in their nests creatures which destroyed themselves or their young; for such a Gamasid as *L. cuneifer* would not apparently have any means of defence against so powerful and well-armed an insect as *Camponotus herculeanus*. I now tried the experiment of killing adult Ants and putting their fresh dead bodies into the cells; very shortly the alimentary canals of all the Gamasids became well-filled, and the creatures strong and healthy. I thought, however, it would be better to avoid any possibility of mistake about this; so I removed the dead Ants and allowed the canals of the Gamasids to become empty once more. I then placed in the cells some dead Ants which I had soaked in carmine stain; the next morning the alimentary canals of the Gamasids were all bright red, while the rest of their bodies was uncoloured. I repeated this several times with the like result, and on one occasion when a very clear Gamasid, which had lately changed from the nymph, had been supplied with a stained Ant and the cell then removed to the stage of the microscope, I saw the Gamasid mount on the body, plunge its trophi into it, and then I could plainly see the small streams of carmine liquid passing down the canal as the Gamasid sucked, and I afterwards dissected out the alimentary canals of some of the Gamasids and found them filled with red matter; the ordinary contents of course are not of that colour. These Gamasids would undoubtedly feed on the dead body of any small freshly-killed insect which might be found in the nest. The Gamasid hereinafter referred to as *Lælaps vacua* I also found would feed and thrive on the dead Ants, &c.; but *Lælaps acuta* I could not get to feed in a similar manner, and it did not live long in the cells. The above facts made it seem probable to me that the *Gamasinæ* were present either as scavengers, or else for the purpose of sharing the feast in the case of small insects killed by the Ants; possibly the friendly conduct of the Ants points rather to the former than the latter conclusion.

In the nests of the same Ant I found three smaller species of *Lælaps*, none of which I could find elsewhere, and which, as far as I know, are unrecorded; I propose calling them *L. flexuosa*, *L. vacua*, and *L. acuta*. The first-named is in one respect a singular creature, viz., as regards the mandible of the male. The mandibles of the *Gamasinæ* and *Uropodinæ* are usually chelæ; very retractile, and capable of being wholly withdrawn within the body. The two arms of the chela are often different, particularly in the male, one arm, oftenest the movable, having frequently some appendage or other complication, often of very strange form, but both arms are almost always directed forward. In the present species the fixed arm is most minute, a mere spike, while the movable arm is very long, horn-like, and doubly curved and undulated, both perpendicularly and laterally; so that the two mandibles cross and cannot be withdrawn into the body (fig. 6 *a*).

In the nests of the same Ant, *Camponotus herculeanus*, I also found a handsome bright-crimson *Uropoda* belonging to the section with sculptured backs; it was present in large numbers in one nest, and in small numbers in one or two others, and was found on the walls of the passages and chambers, and also, most abundantly, on the outside of the cocoons of such pupæ of the Ant as were enveloped in a cocoon; there were often three or four *Uropodæ* on a single cocoon. I could not ascertain that the cocoons were in any way injured, but the *Uropoda* appeared to get a thread or two of the cocoon loose, and this it held on to firmly, as well as I could ascertain, by holding it with the flattened femora of the first pair of legs. I never found any of the *Uropodæ* either upon the adult Ants or their larvæ or upon such pupæ as were not enclosed in a cocoon.

I did not find this *Uropoda* in the nests of any other Ant, but Mr. Bostock has since found it in England in the nests of *Formica fusca*, where also it is found on the cocoons and in the nest.

There was one very good nest of *Camponotus herculeanus*, nearly a thousand feet above Igls, which I kept as a kind of store-house for some time; the tree had been cut down near the ground and the greater part of the stump was beneath the surface or beneath the fallen débris of the forest. I used to dig and cut down into the centre of this nest, take home parts for examination, and carefully put back and cover up the remainder. In this way I kept the Ants in it for some considerable time, and as long as the Ants remained the Gamasids were to be found there; but at last the Ants seemed to get tired of being so frequently disturbed, at any rate they abandoned the nest, and from that time the Gamasids vanished also. I could not find any more. I also frequently examined other abandoned nests, but I never found the Gamasids in them except possibly a single specimen once or twice.

It will thus be seen that I have found seven species of *Gamasinæ* and two of *Uropoda* in Ants' nests (one species previously found by Berlese), and that two other species have been found by others; that none of these have been found elsewhere; and that, so far as has been ascertained, each Gamasid was associated with one or two particular species of Ants only.

I did not find any other Acarina in the nests except a few Oribatidæ, which were in much larger numbers on other stumps where the Ants were not present.

From the above observations I come to the following conclusions:—

1. That there is an association between various species of *Gamasinæ* and certain Ants.

2. That one species of Gamasid usually associates with one or two special species of Ant only, or at least preferentially, although this may be a little affected by the presence or absence of the Ant in different localities.

3. That the Gamasids found in Ants' nests are not usually to be found elsewhere, except probably rare and scattered specimens on careful search.

4. That the Gamasids usually abandon the nest if the Ant does so.

5. That the Gamasids live upon friendly terms with the Ants, who do not attack them and even show signs of taking care of them.

6. That the Gamasids are not true parasites and do not reside upon the bodies of the Ants.

7. That, in the cases investigated, the Gamasids do not kill or injure the Ants or their young.

8. That the Gamasids will eat the dead Ants.

9. That the *Gamasinæ* are not improbably either scavengers or else messmates sharing the feast off any insects which the Ants may kill.

10. That we do not know what the *Uropodinæ* feed on nor the object of their presence in the nests.

Uropoda coccinea, n. sp.[1] (Plate XLIX. figs. 1–1 *f*.)

	♀	♂
	millim.	millim.
Length, about..........	·78	·75
Greatest breadth, about ..	·58	·51

This species somewhat resembles *Uropoda festiva*, Berlese, from Paraguay and, less closely, *U. lamellosa* of the same author (ex Canestrini).

Colour deep crimson in living specimens, after death this fades to a reddish brown or sometimes to a yellowish brown.

Texture very rough and dull.

Shape nearly elliptical, but with the dorsal plate projecting over the rostrum as a narrow plate bent sharply downward and slightly bifid at the distal end.

From the rostral projection a thin undulated lamina runs along each side of the body; it is slightly translucent, widest anteriorly, finely granulated and striated, and strongly bent downward between the second and third pair of legs. Above and within this lamina are two rough and dark, projecting, concentric, chitinous ridges, the inner considerably above the outer; between them is a broad, almost concave, finely granulated band widest at the sides. Within the inner ridge is a plain space slightly granulated, then the back rises sharply from each side toward the median line, which, however, is not an edge or ridge, but is rounded. The raised portion is divided by a deep, irregular, transverse sulcation about two thirds of the way back, which, however, does not reach the median line; thus the two parts of the raised centre are joined by a broad longitudinal joining-piece. The raised parts are not smooth, but each has a very slightly raised space occupying its central portion; the anterior of these is somewhat seven-lobed and the posterior more four-lobed; both are indistinctly marked out and covered by raised, rough, dark broken ridges and lumps, all very irregular and never quite alike in two specimens or on the two sides of the same specimen; amongst these markings six great rounded pieces, which border and project into the transverse sulcation, are much the strongest and darkest. Between all these markings the chitin is granulated but more finely. There are not any hairs on the body.

Mandibles (fig. 1 *b*) very minute, those of male without the pointed spear-like end usual in the genus; each arm of the chela simply bidentate. Palpus with two large spines on the basal, and one on the penultimate joint, besides numerous smaller spines and hairs; one hair on the terminal joint is very large. Epistome (fig. 1 *c*) long and very pointed, with a few spines near the middle. Hypostome (maxillary lip) (fig. 1 *f*) with the two sides (maxillæ) not fused, the outer part of each (galea of Mégnin) of the ordinary type, the inner part (lacinia) a dense brush of long fine hairs. Epipharynx (fig. 1 *d*) triangular, fringed and strewn with fine short hairs. This

[1] If Prof. Berlese's genus of "*Trachyuropoda*" be adopted, this species should be included in it.

organ is often drawn as the lingua and occasionally, I fear, as the epistome, whence great confusion arises; it would bear almost the same relative position to the epistome as in the two figures if seen from below, but the epistome would not advance so far beyond it.

Ventral surface rough, deeply excavated for the reception of the legs, and with numerous strong ridges. There is a singular round chitinous projection, surrounded with a strong rough edge, in the median line between the coxæ of the 4th pair of legs in both sexes, with a deep pit on each side of it. Genital plate of female straight behind, rounded anteriorly, extending from a little in front of the 4th coxæ nearly to those of the first pair. That of the male of the ordinary form and position. All the legs furnished with claws and caruncles.

Hab. Very numerous in one nest of the wood-boring Ant *Camponotus herculeanus* (probably race *ligniperdus*) near Innsbruck, Tyrol, and a few in other nests of the same Ant in the same place. Mr. E. Bostock has since found it fairly abundant in the nests of *Formica fusca* at Buxton, Derbyshire.

LÆLAPS CUNEIFER, n. sp.[1] (Plate XLIX. figs. 2–2*f*.)

	♀	♂
	millim.	millim.
Length, about..........	·77	·64
Greatest breadth, about ..	·60	·47

Colour dull yellow-brown or bay, the specimens vary in depth of tint from light to quite dark.

Texture fully chitinized, smooth but not polished; the whole body covered with irregular reticulations averaging about 25 to 50 to the millimetre, caused by fine raised chitinous ridges. No other markings.

Shape pyriform, very slightly truncated in front, rounded posteriorly. The whole body much arched on the dorsal surface.

Mandibles of male (fig. 2 *b*) with the fixed arm of the chela having a bifid or bidentate end, but not otherwise dentate. Movable arm strongly recurved at the distal end, and with a long, chitinous, curved, accessory piece projecting beyond the principal part of the chela. Epistome (fig. 2 *c*) hyaline, almost rounded, but with a slight tendency to a median point, the whole anterior edge set with sharp points, of which one on each side is somewhat longer than the others. The whole dorsal surface set with short, cuneiform, slightly curved hairs (fig. 2 *f*) at almost equal distances, about 10 to 15 to the millimetre; these also surround the periphery.

Ventral surface of the female (fig. 2 *a*) with anal plate small and spade-shaped; genital plate large, with a semitransparent, rounded, anterior edge overlapping the sternal plate. Peritreme conspicuous, almost straight. The plates on the ventral surface are composed of

[1] According to Professor Berlese's latest classification, although not according to his former ones, this species and the others of the same genus in this paper would probably be considered as belonging to the genus "*Sejus*." I have not thought it wise to adopt this view.

irregular divisions, mostly scale-like in form and varying greatly in size, every division has a crinkled edge. Legs in both sexes without apophyses or projections, first pair considerably the thinnest, all legs terminated by claws and long-shaped caruncles with five anterior points (fig. 2 *e*); on the front pair of legs the claws and caruncles are attached to the end of a rod-like projection of the tarsal joint (fig. 2 *d*). This is common in the *Gamasinæ*, but is much developed in this species.

Hab. Considerable numbers found in the nests of *Camponotus herculeanus* (probably race *ligniperdus* and other varieties) near Innsbruck, Tyrol.

Lælaps lævis, n. sp. (Plate XLIX. figs. 3–3 *b*.)

	♀ millim.
Length, about	1·1
Greatest breadth	·72
Length of legs, 1st pair, about	1·12
,, ,, 2nd ,, ,,	·72
,, ,, 3rd ,, ,,	·72
,, ,, 4th ,, ,,	1·0

Colour lightish chestnut.

Texture fully chitinized, highly polished, entirely without markings.

Shape a long ellipse, almost parallel-sided; slightly rounder posteriorly than anteriorly; much arched on the dorsal surface.

Mandibles of male (fig. 3 *a*).—The fixed arm of the chela has a bifid or bidentate termination, but is not otherwise dentate. Movable arm only slightly recurved at the distal end, and with a single small tooth in addition to the terminal point; it also has a long, slender, slightly curved, and undulated tri- or quadri-dentate accessory piece, with a singular slightly knobbed end with a spike directed backward; it projects considerably beyond the principal portion of the chela. Epistome (fig. 3 *b*) hyaline, indented at a very obtuse angle at each side, and projecting in an obtuse angle, almost a curve, in the centre, the whole edge serrated, the serrations strongest just behind the points of the side angles. There are a few extremely minute white hairs on the dorsal surface, so small as to make it quite impossible to depict them in a drawing on the scale of fig. 3.

Underside of female with anal plate small, spade-shaped; genital and ventral plates fused, the former with a rounded anterior edge, not quite touching the sternal plate. Ventral plate not quite touching the anal. Stigma between the third and fourth legs; peritreme slightly undulated. Legs in both sexes without apophyses. All legs terminated by claws and long-shaped caruncles.

I am not able to give the measurements of the male. I only found one specimen, which I unfortunately dissected before I found out that it was the only example.

Hab. A few found in the nests of ground-ants (species not known) near Innsbruck, Tyrol.

LÆLAPS MYRMOPHILA, n. sp. (Plate XLIX. figs. 4–4 *b*.)

	♀ millim.	♂ millim.
Length, about	·68	·66
Greatest breadth, about	·52	·42
Length of legs, 1st pair, about..	·52	·50
,, ,, 2nd ,, ,, ..	·46	·30
,, ,, 3rd ,, ,, ..	·39	·31
,, ,, 4th ,, ,, ..	·62	·57

Colour lightish chestnut-brown.

Texture highly polished, entirely without markings.

Shape inversely oval, *i. e.* the larger end forward; the anterior margin projects *very* slightly above the rostrum, but this projection is rounded. The hinder part of the body is much more attenuated than the front part. The female is considerably wider in proportion than the male, but still diminishes to a rounded point behind. Dorsal surface considerably arched, particularly the anterior and central portions.

Mandibles of male (fig. 4 *a*) have the fixed arm of the chela greatly curved near the end, which forms a strong tooth; there is another large tooth close behind, and a much smaller one further back; the movable arm also ends in a strong curved tooth, just opposite that of the fixed arm, and has one other strongish tooth. Attached to the side of this arm is a large appendage, which is as thick as the arm and projects beyond it; it is of about equal breadth until near the distal end, then it suddenly diminishes and has a very small bifid termination. Epistome (fig. 4 *b*) almost five-sided, the median side very short, with a small point at each end directed forward; the whole anterior portion of the epistome is edged with very fine points or teeth. There are a few extremely fine and small white hairs on the dorsal surface, too small to be depicted in a drawing on the scale of the figure; one pair, however, near the posterior end are considerably larger, although still small.

The under surface of the female has the plates arranged in a manner similar to that figured in *Lælaps cuneifer*.

Legs in both sexes without apophyses; all legs terminated by claws and caruncles.

Hab. Found commonly in the nests of *Aphænogaster testaceo-pitosa*, Luc., near Ajaccio, in Corsica.

LÆLAPS EQUITANS, n. sp. (Plate L. figs. 5–5 *b*.)

	♀ millim.
Length, about	·62
Greatest breadth, about	·50
Length of legs 1st pair, about..	·50
,, ,, 2nd ,, ,, ..	·29
,, ,, 3rd ,, ,, ..	·31
,, ,, 4th ,, ,, ..	·38

This species has more resemblance to *Lælaps hilaris*, Koch, than to any other with which I am acquainted; it is decidedly different from it. *L. hilaris* is a parasite of the Mouse.

Colour light yellow-brown or bay.

Texture fully chitinized, smooth, almost, but not really, polished. The whole dorsal surface is covered with fine irregular reticulations, which are much longer in the direction across the body than in that from rostrum to posterior end; their length in the former direction averages about twelve, and in the latter about fifty to the millimetre. No other markings.

Shape subdiscoidal, but not actually so. The dorsal plate projects slightly over the rostrum; the greatest breadth is about an eighth less than the greatest length; the body is a trifle narrower posteriorly than anteriorly, and has a slight tendency to a rounded point posteriorly. The back is not strongly arched, the thickness in a dorso-ventral direction being small; it is, however, much greater in the anterior than the posterior part of the body.

Mandibles of male.—I only found one adult male, and dissected this specimen; but the mandibles being very small and delicate, I unfortunately broke them before I could see them clearly. Fig 5 *b* is a representation of the broken organ, from which I conclude that, when perfect, it would greatly resemble that of *Lælaps vacua* (fig. 7 *a*).

The whole dorsal surface is set with long, rather thick and conspicuous hairs, placed at almost regular intervals, but not exactly in rows. Ventral surface of female with ventral and genital plates united, the latter rounded anteriorly. The ventral plate large, almost touching the anal plate. Legs without apophyses, first pair much the longest, all terminated by claws and caruncles. Fourth pair set far forward, and in life usually held almost perpendicularly, and thus concealed beneath the body.

Hab. Found commonly, but not abundantly, in the nests of *Tetramorium cæspitum*, race *meridionale*, Emery, near Ajaccio in Corsica, frequently riding on the heads of the Ants.

All those which I found, with the single exception above noticed, were females. I never saw one with mature eggs in it, and from this circumstance I doubted whether they were adult; they were, however, larger than the male, which certainly was adult, and they had the exterior genital opening well developed. I unfortunately was not aware that the male was the only specimen when I dissected it, and therefore I omitted to measure it.

LÆLAPS FLEXUOSA, n. sp. (Plate L. figs. 6–6 *c*.)

	♀ millim.	♂ millim.
Length, about	·53	·40
Greatest breadth, about	·32	·24
Length of legs, 1st pair, about	·40	·33
„ „ 2nd „ „	·27	·24
„ „ 3rd „ „	·25	·26
„ „ 4th „ „	·43	·39

Colour light yellow-brown or bay.

Texture fully chitinized, except as mentioned below; smooth but not polished; the whole of the dorsal plate is covered with very fine irregular reticulations, which are slightly longer in a direction across the body than in that from rostrum to posterior end; in the former direction they average about 35 to the millimetre. They are difficult to see. No other markings.

Shape almost elliptical, rather more pointed posteriorly than anteriorly.

The chitinized dorsal plate does not cover the whole of the body, but allows a considerable space of white flexible cuticle to be seen at the hinder end; this cuticle, if seen by a sufficient amplification, is found to be finely striated in a transverse direction.

The mandibles of the male (figs. 6 *a*, *b*, *c*) are the remarkable feature of the species; the fixed arm of the chela is merely a very minute straight spike; the movable arm is a long, slender, round horn, not toothed, but doubly undulated, curving downward and across the body; thus the two movable arms cross, and consequently the mandibles cannot be retracted within the body, as those of the Gamasidæ usually can. The whole dorsal surface is set, at nearly regular intervals, about 30 to the millimetre, with spine-like hairs, which gradually increase in length from the anterior to the posterior end of the body; those at the rear are more than twice as long as the anterior ones. Ventral surface of female as in *L. cuneifer*. Legs without apophyses, all terminated by claws and caruncles.

Hab. Found in the nests of *Camponotus herculeanus* (probably race *ligniperdus*), near Innsbruck, Tyrol, but rare.

The nearest ally of this species would seem to be the *Stilochirus rovennensis* of Canestrini.

Lælaps vacua, n. sp. (Plate L. figs. 7–7 *b*.)

	♀ millim.	♂ millim.
Length, about	·53	·49
Greatest breadth, about	·31	·29
Length of legs, 1st pair, about..	·44	·41
„ „ 2nd „ „ ..	·32	·34
„ „ 3rd „ „ ..	·29	·30
„ „ 4th „ „ ..	·44	·41

Colour light yellow-brown or bay.

Texture fully chitinized, smooth but not polished, divided into small, mostly almost hexagonal reticulations; no other markings.

Shape rather shield-shape, sharply cut in front of shoulder, which is the broadest place; the width of the body diminishing towards the posterior end, particularly in the male. Dorsal surface considerably arched.

Mandibles short, those of male (fig. 7 *a*) have the fixed arm of the chela nearly straight for three quarters of its length, then suddenly bent downward so as to form a very large, straight, terminal tooth. There is a single small tooth just behind this. Movable arm nearly straight on the inner edge, with a large, strongly-curved, terminal tooth, and a smaller recurved one a short distance behind it. This arm has a long, slender, round, and undulated accessory piece on its outer side, which projects considerably beyond the rest of the chela. Epistome (fig. 7 *b*) rounded, serrated with small teeth. The dorsal surface is set with smallish, spine-like hairs, at almost regular intervals (about 25 to the millimetre).

The under surface of the female has the plates arranged similarly to those of *Lælaps cuneifer*. The legs are sharply bent at the femora, which makes the measurements of them rather imperfect, they are also much curved; the second and fourth pairs are considerably thicker than the first and third, especially in the male. The tarsi of these legs in the male end in a curious human-foot-like turn, most marked in the fourth leg. The femora of these two legs have two somewhat wedge-shaped hairs on their outer side, the other hairs are mostly fine spines. No apophyses to any leg; all legs terminated by claws and caruncles.

Hab. Found in the nests of *Camponotus herculeanus* (probably race *ligniperdus*), near Innsbruck, Tyrol. Rather common.

LÆLAPS ACUTA, n. sp. (Plate L. figs. 8–8 *b*.)

	♀ millim.	♂ millim.
Length, about	·71	·56
Greatest breadth, about	·46	·32
Length of legs, 1st pair, about	·62	·52
,, ,, 2nd ,, ,,	·42	·36
,, ,, 3rd ,, ,,	·40	·37
,, ,, 4th ,, ,,	·70	·61

Colour lightish chestnut.

Texture fully chitinized, highly polished. With a highish power and a strong light it is seen that the dorsal surface is marked out by very fine lines into irregular, mostly hexagonal or pentagonal, divisions averaging about 25 to the millimetre across the body, and about 50 to the millimetre in an antero-posterior direction. No other markings.

Shape rather narrow anteriorly, more truncated or rounded posteriorly; the sides markedly curved, widest a little in front of the middle. Moderately arched on the dorsal surface.

Mandibles of the male (fig. 8 *a*) very singular; fixed arm of the chela of the ordinary type, rather straight, with a short, sharp, recurved termination, two other teeth not large. The movable arm is much the larger, nearly twice as long as the fixed arm, and much broader; it has a large and a small tooth, near together, about the middle, and a long and sharp upwardly curved end; what appears to be a small channel or duct runs almost its whole length in the interior. No accessory piece. Epistome (fig. 8 *b*) rounded, dentate, the middle teeth considerably the longest. The dorsal surface is set with regularly spaced fine hairs, about ·07 mm. long and about ·03 mm. apart (transversely). Ventral plates as in *L. lævis.* Legs without apophyses, and all terminated by claws and caruncles. The femora with one or two small spines, the other joints with a few fine hairs.

Hab. Not uncommon in the nests of *Camponotus herculeanus* (probably race *ligniperdus*) near Innsbruck, Tyrol.

EXPLANATION OF THE PLATES.

Plate XLIX.

Fig. 1. *Uropoda coccinea* ♀, dorsal aspect, ×65, see p. 646.
1 *a.* „ „ ♀, ventral aspect, ×65.
1 *b.* „ „ ♂, mandible, ×650.
1 *c.* „ „ epistome, ×300.
1 *d.* „ „ epipharynx, ×300.
1 *e.* „ „ palpus, side view, ×220.
1 *f.* „ „ hypostome, ×300.
2. *Lælaps cuneifer* ♀, dorsal aspect, ×55, see p. 647.
2 *a.* „ „ ♀, ventral aspect, ×30.
2 *b.* „ „ ♂, mandible, ×250.
2 *c.* „ „ ♀, epistome, ×170.
2 *d.* „ „ end of tarsus, 1st leg, ×120.
2 *e.* „ „ claw and caruncle, ×350.
2 *f.* „ „ two of the wedge-shaped hairs from the dorsal surface, ×350.
3. *Lælaps lævis* ♀, dorsal aspect, ×35, see p. 648.
3 *a.* „ „ ♂, mandible, ×175.
3 *b.* „ „ epistome, ×120.
4. *Lælaps myrmophila* ♂, dorsal aspect, ×55, see p. 649.
4 *a.* „ „ ♂, mandible, ×190.
4 *b.* „ „ epistome, ×220.

Plate L.

5. *Lælaps equitans* ♀, dorsal aspect, ×50, see p. 649.
5 *a.* „ „ ♀, ventral aspect, ×50.
5 *b.* „ „ ♂, part of mandible (broken, see descriptions), ×750.
6. *Lælaps flexuosa* ♀, dorsal aspect, ×75, see p. 650.
6 *a.* „ „ ♂, the two mandibles and palpi *in situ*, seen from above, ×300.
6 *b.* „ „ ♂, one of the mandibles seen from the side, ×300.
6 *c.* „ „ same mandible from below, ×300.
7. *Lælaps vacua* ♂, dorsal aspect, ×75, see p. 651.
7 *a.* „ „ ♂, mandible, ×700.
7 *b.* „ „ epistome, ×350.
8. *Lælaps acuta* ♀, dorsal aspect, ×45, see p. 652.
8 *a.* „ „ ♂, mandible, ×500.
8 *b.* „ „ epistome, ×220.

4. Notes on the Bornean Rhinoceros. By Edward Bartlett, Naturalist to the Government of Sarawak.

[Received October 29, 1891.]

Four heads and three horns of the Rhinoceros of Borneo are in the Museum at Kuching, Sarawak, of which I send the following details and photographs:—

1. Head with the skin still on it.

Length of head, from front of nose to centre of coronal ridge of skin, $19\frac{1}{2}$ inches; across forehead to corner of eyes $7\frac{3}{4}$ inches; tip of upper lip to corner of mouth $6\frac{1}{4}$ inches; front horn $4\frac{1}{2}$ inches; hind horn 2 inches long. (No. 1 in the photograph.)

2. Head partly covered with skin. Horn 5 inches long; the hind one is merely a round knob. The skull is of about the same size as the first. (No. 2 in the photograph.)

3. Skull only: measures 20 inches from the tip of the nasal bones to the coronal ridge; forehead from eye to eye $5\frac{3}{4}$ inches; lower jaw $16\frac{1}{2}$ inches. (No. 3 in the photograph.)

4. Skull only: from nasal bone to coronal ridge $20\frac{1}{2}$ inches; forehead between the orbits $6\frac{1}{8}$ inches; lower jaw 17 inches. (This skull is not figured in the photograph.)

Horns of *Rhinoceros sumatrensis*, no. 5. (From a photograph.)

5. Two horns on skin of the upper part of the head. Front horn $19\frac{1}{8}$ inches; the second horn is well developed. The base of the front one is 16 inches in circumference. (No. 4 in the photograph.)

6. Single horn 11 inches; circumference of base $11\frac{1}{2}$ inches. (No. 5 in the photograph.)

7. Single horn 6 inches; circumference about 9 inches. (No. 6 in the photograph.)

Skull No. 3 resembles in every respect one which is in the possession of my father (Mr. A. D. Bartlett), which I remember perfectly well, although without particulars. My memory tells me that my father's specimen appeared as though it had been burnt over a fire, exactly like Nos. 3 and 4 above mentioned. The Dyaks roast these animals for food.

The specimen No. 5 in the photograph is similar to the one in my father's possession. The prominence for the second horn is scarcely visible, hence the doubt formerly expressed respecting its belonging to a single- or a two-horned Rhinoceros.

The above-mentioned skulls and horns came from the jungle regions of the upper Rajah River, inhabited by the Kyans, a dangerous race of people, very distinct fron the Dyaks. These Kyans procure the horns for barter, for which they receive a high price from the Chinese, who import them to China for medicine. The horns are ground into powder for some diseases, while others are cut into minute fragments to carry about the person.

The general appearance of this animal (judging from the two heads with skin attached) is similar to that of the Sumatran species (*Rhinoceros sumatrensis*)[1]. It is perfectly black, covered with short black bristles; the ears are short and covered with short black hair without fringe (unlike *R. lasiotis*).

The Rhinoceros is becoming extremely rare in the Province of Sarawak, on account of the value set upon the horns, but in Central and North Borneo in the very old jungle it is more plentiful. I have heard that two species exist; but this, I think, is doubtful.

5. Notes on the Lemming (*Myodes lemmus*).

By T. T. Somerville, of Oppegarde, Christiania[2].

[Received August 10, 1891.]

Very little appears to be authentically known of the exact habitat of the Lemmings, and they seem scarcely ever to be observed except upon the occasion of their great migrations. Their home is probably confined to the great table-lands, at an altitude of 3000 feet or more, on the mountains of Central Norway, and further north on the ranges between Norway and Sweden. Indeed ancient writers asserted that the sudden appearance of Lemmings was due to their being showered from the clouds, and even to this day there are many worthy peasants who are at a loss for any other explanation. Certain it is that for indefinite periods, of from four or five up to, perhaps, twenty years, the Lemming is never seen in the inhabited parts of the country, and then suddenly appears in countless hordes

[1] *Cf.* Flower, P. Z. S. 1880, p. 69.

[2] [Along with the present communication we received from Mr. Somerville seven living examples of the Lemming for the Menagerie. Of these two are still living; the other five died on the following dates:—(1) Aug. 20, 1891. (2) Aug. 31, 1891. (3) Oct. 19, 1891. (4) Nov. 7, 1891. (5) Nov. 27, 1891. —P. L. S.]

over whole provinces. Usually the mountain-pastures and high-lying farms are the first to suffer, and it is positively asserted that the crops on such farms have been entirely eaten off, and that even in the more generally cultivated valleys the loss to the farmers is frequently very serious.

The numbers that take part in these migrations have been estimated at many millions, and there are most extraordinary stories told to show how, on these occasions, the Lemming-host goes straight forward, climbing over or burrowing under every obstacle and never diverging from its course. How far these stories are reliable we will not venture to consider, but it is quite certain that the Lemmings unhesitatingly attempt to cross streams too rapid and lakes too wide for them to swim across, and that they tumble into holes, wells, and brooks, the sides of which are too steep for them to scramble out of again, so that, frequently, people are at a loss to obtain water that is not polluted by their bodies. Doubtless this accounts for an epidemic, popularly termed "Lemming fever," that is said to prevail after the migration and which is described as resembling ordinary typhoid.

The Lemmings never return from their exodus. Those that reach the coast alive are said to swim straight away to sea; and this may be the case on the west coast, towards which, naturally enough from the geographical formation of the country, the majority direct their march. On the coast-line between Christiania and the southernmost point the Lemmings are certainly not always so precipitate, but, occasionally at least, spend weeks or months before taking to the water or being cut off by battle or disease. When they do begin to disappear, it is not many days before they are no longer to be met with alive, while the number of dead bodies to be seen everywhere, both on land and along the shores of lakes, rivers, and fjords, proves that they have not "melted into thin air," in whatever manner they may have come into the country.

Personally we can date our acquaintance with the Norwegian Lemmings back to the autumn of 1872, when we were grouse-shooting on the mountains around the celebrated Rjukan Foss in Telemarken. Upon that occasion we captured a number and succeeded in finding four that lived harmoniously together, and which became very tame during the two or three weeks we had them. We thought of presenting them to this Society, but they were unfortunately drowned on our passage down the lake Tinsö.

In 1876 we found, on getting to Norway in the month of April, that the whole coast, at all events from the Christiania fjord to Christiansand, swarmed with Lemmings that had descended during the previous autumn. One gentleman told us that in the town of Arendal, the first thing to be done every morning was to collect the bodies of Lemmings in the streets and in the courtyards of the houses that had been killed by cats during the night. In the courtyard of his own dwelling he had counted up to twenty-seven dead Lemmings one morning.

We found the same state of things further north. Under almost every juniper bush and under every suitable rock or big stone were the signs of the Lemmings which had their burrows beneath, and even the towns were full of them. We had no difficulty in catching about a dozen, of which we placed three or four in each of as many empty bird-cages. Next morning all or almost all were dead. Many or most had wounds in the throat. We repeated our attempts to preserve some, but they either died or were killed by each other. We were told that, at this season especially, these animals fought desperately, and that the usual result of each combat was the death of both parties. This appeared to be true. Moreover, we were assured that the *new grass*, with which we supplied our captives, invariably caused the death of all the Lemmings. This belief we have subsequently heard expressed most firmly in every part of the country, and there really seems to be some good reason for it. In the case in question the snow was disappearing fast, the new grass was beginning to shoot up, and in a very short time not a living Lemming remained anywhere. It seems that the Lemmings when they reach the coast frequently spend the winter there, but when the spring sets in they all die. Professor Collett, of the Christiania University, cannot accept the theory of the new grass causing the death of the Lemmings, but asserts that this is due to a disease such as always appears when animals multiply to an abnormal extent and which he cannot believe is caused in any way by the grass.

In 1887 we again came across some Lemmings on the mountain-plateau beyond the Rjukan Foss, and we secured a couple. These, however, escaped when we were on our way home, by gnawing through the box in which they were placed, and we were unable to get others.

Towards the end of June this year we found Lemmings in great force on the mountains around the "Gausdal Sanatorium," a hydropathic establishment situated about 2500 feet above the sea within a day's journey from Christiania. We were informed that a few weeks earlier there had been hundreds for every one remaining; and this was easy to believe, for the number of dead bodies was in many places very great. There were, however, still so many that it was scarcely possible to walk for an hour without seeing several.

On the 13th of July we secured a Lemming which, although apparently not full-grown, seemed likely to have little ones. She was from the first unusually docile, and appeared much satisfied with the arrangements made for her. We had thoroughly scraped and washed a cigar-box, lightly filled it with moss, made an entrance-hole and a couple of ventilators, and fastened down the lid; this we placed in her box while a more elaborate dwelling was being prepared. Next day, 14th July, when about to transfer the Lemming to the new box, we found that she had given birth to six little ones. These were naked, pink, blind, and very ugly little wretches with huge heads. The moss in the cigar-box had been formed into a sort of round nest, and a quantity of paper, torn to fine shreds, formed the lining, in the centre of which were the young. That day and the next the mother was scarcely ever in the cigar-box, and we feared that she had deserted the nest, but on looking in on the third day the little ones were seen to be alive. We had the pleasure next day of examining one of the little ones that had come out of the cigar-box; it was quite blind and unable to walk, it could only scratch and kick and roll over, and it was still quite naked but that a sort of silky shade was doubtless the commencement of a coat. Still the little animal more resembled in texture a good fat caterpillar than a fur-bearing mammal. We noticed now distinctly how the skin was stained black precisely where the black markings would appear, and the ears, legs, and tail appeared to have made most progress since our former hasty glances. The mother let it remain for some time, when she took it in her mouth and carried it in. After that it frequently happened that one or two rolled out or were dragged out attached to the teat, and the mother always took them in again before very long. On the 21st July—the eighth day—the silky coats of the little ones began really to show nicely in their proper colours. They were still quite blind and were become exceedingly thin, long, and leggy; they began to run out and in a day or two later, and from the 24th July, the eleventh day of their age, would run about—still blind—in, over, and under the moss in the two apartments of their box, in one of which the cigar-box, occupying about a third of the compartment, formed their sleeping-chamber. Two days later (26th July) their eyes began to open a very little, and next day were fully open; they were now about the size of a common mouse, and they began to nibble at the moss and other eatables.

On the 29th July the mother died. We hope her six little ones are now able to do without her.

We should have mentioned that we had obtained, besides those specified as having escaped or died, four two-thirds grown Lemmings, three half-grown, and one enormous old female, the very largest we have seen, and which on the night of the 22nd July brought forth nine little ones. This interesting creature is most extraordinarily docile, allows our children to handle both herself and young, and does not even seem to object to the three half-grown Lemmings entering her box and her nest. These half-grown Lemmings we took one day from their nest; there were five, but the other two escaped. In the immediate neighbourhood was another nest in which were five young ones, but when we left Gausdal Sanatorium these were still too young to take.

We left Gausdal Sanatorium on the 23rd July with our nine Lemmings and fifteen young ones; these were carefully conveyed to Christiania, and some of them were subsequently forwarded to the Society.

APPENDIX.

LIST OF ADDITIONS TO THE SOCIETY'S MENAGERIE

DURING THE YEAR

1891.

Jan. 6. 1 Peregrine Falcon (*Falco peregrinus*). Presented by A. C. Ionides, Esq.

7. 2 Virginian Foxes (*Canis virginianus*). Received in Exchange.

8. 1 Humboldt's Lagothrix (*Lagothrix humboldti*), ♂. Purchased.

9. 1 Starred Tortoise (*Testudo stellata*). Presented by W. J. Bosworth, Esq.

2 Toque Monkeys (*Macacus pileatus*), 2 ♀. Presented by W. J. Bosworth, Esq.

12. 2 Large Hill-Mynahs (*Gracula religiosa*). Deposited.

14. 1 Ring-tailed Coati (*Nasua rufa*), ♀. Presented by E. Hopkinson, Esq.

16. 1 Red Lory (*Eos rubra*). Purchased.

19. 1 Ring-tailed Coati (*Nasua rufa*), ♂. Presented by Cyril Smith, Esq.

20. 1 Rhesus Monkey (*Macacus rhesus*), ♀. Deposited.

22. 2 Hawfinches (*Coccothraustes vulgaris*), 2 ♂. Presented by J. Newton Hayley, Esq.

2 Blood-breasted Pigeons (*Phlogœnas cruentata*). Presented by Wilfrid G. Marshall, Esq.

1 Chinese Turtle-Dove (*Turtur chinensis*). Presented by Wilfrid G. Marshall, Esq.

1 Yellow-crowned Penguin (*Eudyptes antipodum*). From Stewart's Island, New Zealand. Presented by Sir Henry W. Peek, Bart., F.Z.S. See P. Z. S. 1891, p. 121.

25. 1 Macaque Monkey (*Macacus cynomolgus*), ♂. Presented by Count Povoleri, F.Z.S.

4 Restless Cavies (*Cavia porcellus*). Presented by Count Povoleri, F.Z.S.

26. 1 Variegated Sheldrake (*Tadorna variegata*), ♀. Received in Exchange.

1 Red-necked Grebe (*Podiceps griseigena*). Presented by Thos. Hardcastle, Esq.

Jan. 27. 1 Black-headed Lemur (*Lemur brunneus*), ♂. Deposited.
1 American Bison (*Bison americanus*), ♂. Born in the Menagerie.
2 Japanese Pheasants (*Phasianus versicolor*), ♂ ♀. Presented by E. Wormald, Esq., F.Z.S.
28. 1 Triton Cockatoo (*Cacatua triton*). Deposited.
1 Milne-Edwards's Porphyrio (*Porphyrio edwardsi*). Purchased.
1 Grey-headed Porphyrio (*Porphyrio poliocephalus*). Purchased.
30. 1 Indian Python (*Python molurus*). Received in Exchange.
40 River Lampreys (*Petromyzon fluviatilis*). Presented by Mr. Thos. F. Burrows.
31. 2 Passerine Owls (*Glaucidium passerinum*). Presented by St. John Northcote, Esq.

Feb. 4. 2 Common Peafowls (*Pavo cristata*), ♀. Presented by Rich. Hunter, Esq.
5. 1 Malbrouck Monkey (*Cercopithecus cynosurus*), ♂. Presented by J. P. Heseltine, Esq., F.Z.S.
1 Malbrouck Monkey (*Cercopithecus cynosurus*), ♀. Presented by Mrs. Newton.
2 Globose Curassows (*Crax globicera*), ♂ ♀. Deposited.
1 Daubenton's Curassow (*Crax daubentoni*), ♂. Deposited.
2 Mexican Guans (*Penelope purpurascens*). Deposited.
10. 6 Night-Herons (*Nycticorax griseus*). Presented by Mr. A. A. van Bemmelen, C.M.Z.S.
11. 1 Spotted Eagle Owl (*Bubo maculosus*). Presented by Julius Wilson, Esq.
2 Yellow-throated Rock-Sparrows (*Petronia petronella*). Deposited.
13. 1 Red Deer (*Cervus elaphus*), ♀. Presented by C. J. H. Tower, Esq., F.Z.S.
14. 1 Redwing (*Turdus iliacus*). Presented by Mrs. J. B. Capper.
7 Knots (*Tringa canutus*). Purchased.
2 Bar-tailed Godwits (*Limosa lapponica*). Purchased.
16. 1 Scaup (*Fuligula marila*), ♂. Purchased.
1 Curlew (*Numenius arquata*). Purchased.
17. 2 Burbots (*Lota vulgaris*). Presented by Mr. T. F. Burrows.
18. 1 Jack Snipe (*Gallinago gallinula*). Presented by W. H. St. Quintin, Esq., F.Z.S.
1 Common Buzzard (*Buteo vulgaris*). Presented by W. H. St. Quintin, Esq., F.Z.S.
1 Macaque Monkey (*Macacus cynomolgus*), ♀. Presented by Henry Williams, Esq.
19. 1 Green Monkey (*Cercopithecus callitrichus*), ♂. Presented by A. Mann, Esq.
1 Grey Ichneumon (*Herpestes griseus*), ♀. Presented by J. Seymour Bartlett, Esq.
21. 1 Little Grebe (*Tachybaptes fluviatilis*). Presented by Miss E. Bartlett.
23. 1 New-Zealand Parrakeet (*Cyanorhamphus novæ-zealandiæ*). Received in Exchange.
24. 2 Wonga-Wonga Pigeons (*Leucosarcia picata*), ♂ ♀. Received in Exchange.
25. 1 Gayal (*Bibos frontalis*), ♀. Born in the Menagerie.
1 Long-tailed Weaver-bird (*Chera progne*). Deposited.
2 Chinese White-eyes (*Zosterops simplex*). Deposited.

Feb. 26. 2 Upland Geese (*Bernicla magellanica dispar*), ♂ ♀. Purchased.
27. 2 Upland Geese (*Bernicla magellanica*), ♂ ♀. Purchased.
1 Herring-Gull (*Larus argentatus*). Presented by the Rev. C. A. Berry.
28. 1 Wapiti Deer (*Cervus canadensis*), ♂. Deposited.
1 Red-throated Diver (*Colymbus septentrionalis*). Presented by E. J. Gale, Esq.
6 Grayling (*Thymallus vulgaris*). Presented by Howard L. Cooper, Esq.
6 Grayling (*Thymallus vulgaris*). Presented by — Jukes, Esq.

Mar. 3. 2 Red-beaked Weaver-birds (*Quelea sanguinirostris*). Presented by Mrs. Hastings.
1 West-African Python (*Python sebæ*). Deposited.
4. 2 North-American Turkeys (*Meleagris gallopavo*), ♂ ♀. Purchased.
6 Shore-Larks (*Otocorys alpestris*). Purchased.
6. 1 Snow-Leopard (*Felis uncia*). From Bhootan. Purchased. See P. Z. S. 1891, p. 212.
1 Serval (*Felis serval*), ♀. Presented by D. Wilson, Esq.
1 White Frog (*Rana temporaria*, var.). Presented by W. Hannaford, Esq.
7. 1 Collared Peccary (*Dicotyles tajaçu*), ♀. Purchased.
1 Yellow-footed Rock-Kangaroo (*Petrogale xanthopus*), ♂. Born in the Menagerie.
1 Rhesus Monkey (*Macacus rhesus*), ♂. Deposited.
9. 1 Passerine Parrakeet (*Psittacula passerina*). Presented by Miss Edith Blanche Burrell.
1 Bennett's Wallaby (*Halmaturus bennetti*), ♀. Deposited.
10. 1 Maguari Stork (*Dissura maguari*). Purchased.
1 Brazilian Teal (*Querquedula brasiliensis*), ♂. Purchased.
12. 1 Striped Hyæna (*Hyæna striata*), ♂. Purchased.
1 Indian Muntjac (*Cervulus muntjac*), ♀. Born in the Menagerie.
1 Indian White Crane (*Grus leucogeranos*). Deposited.
13. 1 Markhoor (*Capra megaceros*), ♂. Received in exchange from the Zoological Gardens, Calcutta.
16. 1 Small-clawed Otter (*Lutra leptonyx*). Purchased. See P. Z. S. 1891, p. 212.
6 Amherst Pheasants (*Thaumalea amherstiæ*), 6 ♂. Purchased.
17. 1 Common Otter (*Lutra vulgaris*). Presented by G. C. Edwardes-Ker, Esq.
1 Common Rhea (*Rhea americana*). Presented by Mrs. Hatfield.
2 Leopard Tortoises (*Testudo pardalis*). From the Cape Colony. Presented by the Rev. G. H. R. Fisk, C.M.Z.S.
5 Angulated Tortoises (*Chersina angulata*). From the Cape Colony. Presented by the Rev. G. H. R. Fisk, C.M.Z.S.
1 Tuberculated Tortoise (*Homopus femoralis*). From the Cape Colony. Presented by the Rev. G. H. R. Fisk, C.M.Z.S.
4 Areolated Tortoises (*Homopus areolatus*). From the Cape Colony. Presented by the Rev. G. H. R. Fisk, C.M.Z.S.
1 Hygian Snake (*Elaps hygiæ*). From the Cape Colony. Presented by the Rev. G. H. R. Fisk, C.M.Z.S.
4 Smooth Clawed-Frogs (*Xenopus lævis*). From the Cape Colony. Presented by the Rev. G. H. R. Fisk, C.M.Z.S.

Mar. 17. 1 Square-marked Toad (*Bufo regularis*). From the Cape Colony. Presented by the Rev. G. H. R. Fisk, C.M.Z.S.
18. 1 Lhuys's Impeyan Pheasant (*Lophophorus lhuysi*), ♂. Purchased. From Szechuen, China. See P. Z. S. 1891, p. 212.
19. 1 Ruddy Sheldrake (*Tadorna casarca*), ♀. Purchased.
20. 1 Brazilian Caracara (*Polyborus brasiliensis*). Presented by J. D. Spooner, Esq.
21. 2 White-throated Capuchins (*Cebus hypoleucos*), 2 ♂. Purchased.
1 Coquerel's Lemur (*Cheirogaleus coquereli*), ♀. Purchased.
1 Collared Peccary (*Dicotyles tajaçu*), ♂. Purchased.
2 Griffon Vultures (*Gyps fulvus*). Purchased.
1 Green-cheeked Amazon (*Chrysotis viridigenalis*). Presented by Miss Julia Crooke.
23. 1 Purple-faced Monkey (*Semnopithecus leucoprymnus*). Presented by Mrs. Sutton Sams.
1 Black-headed Lemur (*Lemur brunneus*). Born in the Menagerie.
24. 1 Sooty Mangabey (*Cercocebus fuliginosus*), ♂. Presented by Miss Kathleen Hill.
1 India Civet (*Viverricula malaccensis*). Presented by Col. A. Bloomfield.
2 Malabar Squirrels (*Sciurus maximus*). Presented by Col. A. Bloomfield.
1 Laughing Kingfisher (*Dacelo gigantea*). Presented by Chas. C. Barton, Esq.
26. 5 Summer Ducks (*Æx sponsa*), 5 ♀. Purchased.
4 Gadwalls (*Chaulelasmus streperus*), 2 ♂, 2 ♀. Purchased.
28. 1 Two-spotted Paradoxure (*Nandinia binotata*). Presented by Dr. J. Galbraith Westlake.
30. 2 Violaceous Plantain Cutters (*Musophaga violacea*). Purchased.
1 Carpet-Snake (*Morelia variegata*). Purchased.
31. 1 Arctic Fox (*Canis lagopus*), ♀. Presented by H. Sacheverel Bateman, Esq.

April 1. 1 Rhesus Monkey (*Macacus rhesus*), ♂. Deposited.
3. 1 Squirrel-like Phalanger (*Belideus sciureus*), ♂. Presented by Mrs. Fitz-Gerald.
1 Vulpine Phalanger (*Phalangista vulpina*), ♀. Born in the Menagerie.
1 Collared Fruit-Bat (*Cynonycteris collaris*). Born in the Menagerie.
4 Cape Colies (*Colius capensis*). Purchased.
1 Lacertine Snake (*Cœlopeltis lacertina*). Presented by J. C. Warburg, Esq.
4. 1 Common Wolf (*Canis lupus*), ♀. Deposited.
6. 1 Spiny-tailed Mastigure (*Uromastix acanthinurus*). Presented by Mr. W. Williams.
3 Puff-Adders (*Vipera arietans*). From the Cape Colony. Presented by the Rev. G. H. R. Fisk, C.M.Z.S.
3 Egyptian Cobras (*Naia haje*). From the Cape Colony. Presented by the Rev. G. H. R. Fisk, C.M.Z.S.
7. 3 Partridge Bronze-wing Pigeons (*Geophaps scripta*). Purchased.
3 Maned Geese (*Bernicla jubata*). Purchased.
1 Tuatera Lizard (*Sphenodon punctatus*). Presented by Thos. E. Phillips, Esq.

April 7. 1 Red-spotted Lizard (*Eremias rubro-punctatus*). Presented by Dr. Drewell.
1 Brush Bronze-wing Pigeon (*Phaps elegans*). Purchased.
2 Scorpions (*Scorpio*, sp. inc.). Presented by Sidney H. Carver, Esq.
8. 2 Chipping Squirrels (*Tamias striatus*). Presented by Mr. A. W. Jutson.
2 Indian Pied Hornbills (*Anthracoceros malabaricus*). Purchased.
10. 1 Brown Milvago (*Milvago chimango*). Presented by J. Mand, Esq.
13. 2 Suricates (*Suricata tetradactyla*). Presented by J. W. Munt, Esq.
14. 2 Azara's Opossums (*Didelphys azaræ*), ♂ ♀. Presented by Edward C. Hawes, Esq.
15. 1 Lesser Orang (*Simia morio*), ♂. Presented by Commander Ernest Rason, R.N. From Sarawak, Borneo. See P. Z. S. 1891, p. 301.
1 Lion (*Felis leo*), ♀. Purchased.
16. 1 Grey Parrot (*Psittacus erithacus*). Deposited.
17. 1 Nylghaie (*Boselaphus tragocamelus*), ♂. Purchased.
20. 1 Sooty Mangabey (*Cercocebus fuliginosus*), ♂. Presented by F. J. Bennett, Esq.
1 Egyptian Cat (*Felis chaus*). Purchased.
2 Mace's Sea-Eagles (*Haliaetus leucoryphus*). Purchased.
1 Common Night-Heron (*Nycticorax griseus*). Purchased.
1 Great-billed Tern (*Phaethusa magnirostris*). Purchased. See P. Z. S. 1891, p. 301.
21. 1 Azara's Agouti (*Dasyprocta azaræ*), ♂. Purchased.
22. 1 Vulpine Phalanger (*Phalangista vulpina*), ♂. Born in the Menagerie.
23. 1 Brown Howler (*Mycetes fuscus*), ♂. Presented by E. Luxmore Marshall, Esq.
2 Wild Swine (*Sus scrofa*, jr.). Presented by Alex. Williams, Esq.
1 Black-footed Penguin (*Spheniscus demersus*). Presented by H. B. Bingham, Esq., F.Z.S.
1 Rock-hopper Penguin (*Eudyptes chrysocome*). Presented by H. B. Bingham, Esq., F.Z.S.
24. 3 Ring-necked Parrakeets (*Palæornis torquatus*), 1 ♂, 2 ♀. Presented by Miss E. Ogilvie.
25. 1 Common Fox (*Canis vulpes*). Deposited.
2 White Pelicans (*Pelecanus onocrotalus*). Presented by Miss Dolly Bason.
1 Common Barn-Owl (*Strix flammea*). Presented by H. Bendelack Hewetson, Esq.
1 Defenceless Lizard (*Agama inermis*). Presented by Gerald Graham-Clarke, Esq.
27. 2 Rooks (*Corvus frugilegus*). Purchased.
28. 1 Rhesus Monkey (*Macacus rhesus*), ♀. Presented by Mrs. Emily Palmer.
2 Tasmanian Wolves (*Thylacinus cynocephalus*), ♂ ♀. Received in exchange.
3 Ursine Dasyures (*Dasyurus ursinus*), 1 ♂, 2 ♀. Purchased.
4 Australian Wild Ducks (*Anas superciliosus*), 2 ♂, 2 ♀. Purchased.
2 Brush-Turkeys (*Talegalla lathami*), ♂ ♀. Purchased.

April 29. 1 Common Viper (*Vipera berus*). Presented by R. M. J. Teil, Esq.
1 European Tree-Frog (*Hyla arborea*). Presented by — Barclay, Esq.
30. 1 Black Lemur (*Lemur macaco*). Born in the Menagerie.
2 Persian Gazelles (*Gazella subgutturosa*), ♂ ♀. Born in the Menagerie.
2 Herring-Gulls (*Larus argentatus*). Presented by Mrs. Attenborough.
1 Pine-Grosbeak (*Pinicola enucleator*), ♂. Presented by W. H. St. Quintin, Esq.

May 1. 1 Bennett's Wallaby (*Halmaturus bennetti*), ♂. Deposited.
2. 1 Sky-Lark (*Alauda arvensis*). Presented by B. Michael Smith, Esq., F.Z.S.
1 Shore-Lark (*Otocorys alpestris*). Presented by B. Michael Smith, Esq., F.Z.S.
1 Goldfinch (*Carduelis elegans*). Presented by B. Michael Smith, Esq., F.Z.S.
2 Diamond Snakes (*Morelia spilotes*). Deposited.
2 Brazilian Caracaras (*Polyborus brasiliensis*). Presented by F. E. Cobb, Esq., C.M.Z.S. From Tierra del Fuego.
1 Turkey Buzzard (*Cathartes aura*). From the Falkland Islands. Presented by F. E. Cobb, Esq., C.M.Z.S.
5. 1 Pig-tailed Monkey (*Macacus nemestrinus*), ♀. Presented by E. Powell, Esq.
2 Cheer Pheasants (*Phasianus wallichi*), ♂ ♀. Purchased.
6. 12 Common Teal (*Querquedula crecca*), 4 ♂, 8 ♀. Purchased.
1 Viscacha (*Lagostomus trichodactylus*). Born in the Menagerie.
8. 2 Brown Capuchins (*Cebus fatuellus?*), 2 ♂. Presented by James Meldrum, Esq.
1 Ocelot (*Felis pardalis*). Presented by James Meldrum, Esq.
1 Coypu (*Myopotamus coypus*), ♂. Presented by James Meldrum, Esq.
2 Ring-tailed Coatis (*Nasua rufa*), ♀. Presented by James Meldrum, Esq.
2 Cayenne Lapwings (*Vanellus cayennensis*). Presented by James Meldrum, Esq.
7 Burrowing Owls (*Speotyto cunicularia*). Presented by James Meldrum, Esq.
1 Common Hare (*Lepus europæus*). Presented by Mr. H. J. Bowes.
1 Red Kangaroo (*Macropus rufus*), ♂. Born in the Menagerie.
9. 3 Pintail (*Dafila acuta*), 2 ♂, 1 ♀. Presented by G. F. Mathews, Esq., R.N., F.Z.S.
1 Mandarin Duck (*Æx galericulata*), ♀. Presented by G. F. Mathews, Esq., R.N., F.Z.S.
1 Common Boa (*Boa constrictor*). Presented by the Demerara Museum.
12. 2 Swinhoe's Pheasants (*Euplocamus swinhoii*), ♂ ♀. Purchased.
2 Japanese Pheasants (*Phasianus versicolor*), 2 ♀. Purchased.
2 Amherst Pheasants (*Thaumalea amherstiæ*), 2 ♀. Purchased.
2 Brent Geese (*Bernicla brenta*). Presented by Mrs. Atkinson.
1 Pintail (*Dafila acuta*), ♂. Presented by Mrs. Atkinson.
2 Wigeon (*Mareca penelope*), ♂ ♀. Presented by Mrs. Atkinson.

May 12. 1 Common Sheldrake (*Tadorna vulpanser*), ♀. Presented by Mrs. Atkinson.
2 Golden Tench (*Tinca vulgaris*, var.). Presented by Mrs. Atkinson.
9 Golden Carp (*Carassius auratus*). Presented by Mrs. Atkinson.
1 European Tree-Frog (*Hyla arborea*). Presented by Miss Wright.
13. 1 Crested Porcupine (*Hystrix cristata*). Deposited.
14. 2 Indian Desert-Foxes (*Canis leucopus*). Born in the Menagerie.
1 Tibetan Crossoptilon (*Crossoptilon tibetanum*), ♀. Purchased. From Szechuen, China.
1 Black-necked Stilt Plover (*Himantopus nigricollis*). Purchased.
1 Cayenne Lapwing (*Vanellus cayennensis*). Purchased.
1 Wild Swine (*Sus scrofa*), ♀. Received in Exchange. From Persia.
15. 8 European Tree-Frogs (*Hyla arborea*). Presented by Clifford D. Fothergill, Esq.
1 Striped Hyæna (*Hyæna striata*); ♀. From Karachi. Presented by B. T. Ffinch, Esq., C.M.Z.S.
16. 2 Golden Agoutis (*Dasyprocta aguti*). Presented by H. Barringer, Esq.
18. 1 Japanese Deer (*Cervus sika*), ♂. Born in the Menagerie.
1 Capybara (*Hydrochœrus capybara*), ♀. Purchased.
19. 1 Japanese Deer (*Cervus sika*), ♀. Born in the Menagerie.
20. 1 Common Rhea (*Rhea americana*). Presented by R. P. Houston, Esq.
2 Variegated Sheldrakes (*Tadorna variegata*), ♂ ♀. Purchased.
4 Crested Screamers (*Chauna chavaria*). Presented by the Duke of Newcastle.
2 Larger Tree-Ducks (*Dendrocygna major*). Purchased.
21. 1 Barbary Ape (*Macacus inuus*), ♂. Presented by the Rev. H. G. Watkins.
1 Dog (*Canis familiaris*). From New Guinea. Presented by A. McIlwraith, Esq., F.Z.S.
1 Tree-Boa (*Corallus hortulanus*). From Trinidad. Presented by Messrs. R. R. Mole and Fritz Urich.
1 South-American Rat Snake (*Spilotes variabilis*). From Trinidad. Presented by Messrs. R. R. Mole and Fritz Urich.
1 Carinated Snake (*Herpetodryas carinatus*). From Trinidad. Presented by Messrs. R. R. Mole and Fritz Urich.
2 Plica Lizards (*Uraniscodon plica*). From Trinidad. Presented by Messrs. R. R. Mole and Fritz Urich.
1 African Wild Ass (*Equus tæniopus*), ♂. Born in the Menagerie.
2 Blue-bearded Jays (*Cyanocorax cyanopogon*). Deposited.
1 Brown Chimango (*Milvago chimango*). Deposited.
1 Violaceous Night-Heron (*Nycticorax violaceus*). Deposited.
22. 1 Moorish Tortoise (*Testudo mauritanica*). Presented by Mrs. Margaret Clarke.
1 Chinchilla (*Chinchilla lanigera*). Born in the Menagerie.
23. 1 Black-eared Marmoset (*Hapale penicillata*). Presented by Aberey Lace, Esq.
1 Diuca Finch (*Diuca grisea*). From Chili. Presented by Mrs. Charles G. Sharpe.

May 23. 2 Gay's Finches (*Phrygilus gayi*). From Chili. Presented by Mrs. Charles G. Sharpe.
2 De Filippi's Meadow-Starlings (*Sturnella defilippi*). Presented by Mrs. Charles G. Sharpe.
25. 1 Japanese Deer (*Cervus sika*), ♀. Born in the Menagerie.
26. 1 Water-Buck Antelope (*Cobus ellipsiprymnus*), ♀. Presented by G. S. Mackenzie, Esq., F.Z.S. From Mombasa. See P. Z. S. 1891, p. 326.
1 Leopard (*Felis pardus*). Presented by G. S. Mackenzie, Esq., F.Z.S. From Kismayu, E. Africa.
2 Vulturine Guinea-fowls (*Numida vulturina*). Presented by G. S. Mackenzie, Esq., F.Z.S. From Kismayu, E. Africa.
2 Mitred Guinea-fowls (*Numida mitrata*). From Mombasa. Presented by G. S. Mackenzie, Esq., F.Z.S.
28. 2 Coypu Rats (*Myopotamus coypus*). Purchased.
2 Andaman Starlings (*Sturnia andamanensis*). Purchased.
2 Red-billed Hornbills (*Toccus erythrorhynchus*). Purchased.
2 Snow-Buntings (*Plectrophanes nivalis*). Purchased.
2 Red-headed Buntings (*Emberiza luteola*). Purchased.
2 African Spoonbills (*Platalea alba*). Purchased.
1 Peregrine Falcon (*Falco peregrinus*). Presented by Thos. C. Smith, Esq.
1 Red Deer (*Cervus elaphus*), ♂. Born in the Menagerie.
29. 1 Mountain Ka-Ka (*Nestor notabilis*). Presented by Herbert Furber, Esq.
30. 1 Ducorps's Cockatoo (*Cacatua ducorpsi*). Presented by Nicholas O'Reilly, Esq.
4 Californian Quails (*Callipepla californica*), 1 ♂, 3 ♀. Presented by Nicholas O'Reilly, Esq.
2 Grey Squirrels (*Sciurus griseus*). Presented by Nicholas O'Reilly, Esq.
1 Hudson's-Bay Squirrel (*Sciurus hudsonius*). Presented by Nicholas O'Reilly, Esq.
3 Blanford's Rats (*Mus blanfordi*). Presented by W. L. Sclater, Esq., F.Z.S. From the Shevaroy Hills, Madras Pres. See P. Z. S. 1891, p. 326.
4 Ocellated Terrapins (*Morenia ocellata*). From the Hoogly, India. Presented by W. L. Sclater, Esq., F.Z.S.
2 Virginian Eagle Owls (*Bubo virginianus*). Purchased. From the Straits of Magellan.
31. 2 Ravens (*Corvus corax*). Presented by Capt. Ogilby.

June 2. 1 Collared Fruit-Bat (*Cynonycteris collaris*). Born in the Menagerie.
1 Diamond Snake (*Morelia spilotes*). Presented by Mr. T. Hellberg.
3. 2 Senegal Piapecs (*Ptilostomus senegalensis*). Purchased.
1 Madeiran Pigeon (*Columba trocaz*). Deposited.
4. 1 Macaque Monkey (*Macacus cynomolgus*), ♀. Presented by Mr. Walter Fraser.
4 North-African Jackals (*Canis anthus*). Born in the Menagerie.
5. 4 Macqueen's Bustards (*Houbara macqueeni*), 2 ♂, 2 ♀. Presented by B. T. Ffinch, Esq., C.M.Z.S. From Mekran.
1 Great Black-headed Gull (*Larus ichthyaëtus*). Presented by B. T. Ffinch, Esq., C.M.Z.S. From the Persian Gulf. See P. Z. S. 1891, p. 464.

June 5. 3 Chaplain Crows (*Corvus capellanus*). Presented by B. T. Ffinch, Esq., C.M.Z.S.

1 Common Viper (*Vipera berus*). Presented by W. H. B. Pain, Esq.

6. 1 Rhesus Monkey (*Macacus rhesus*), ♀. Presented by Col. Beresford.

7. 2 Partridge Bronze-wing Pigeons (*Geophaps scripta*). Hatched in the Gardens.

8. 2 Radiated Tortoises (*Testudo radiata*). From Madagascar. Presented by the Rev. G. H. R. Fisk, C.M.Z.S.

1 Angulated Tortoise (*Chersina angulata*). From the district of Clanwilliam, Cape Colony. Presented by the Rev. G. H. R. Fisk, C.M.Z.S.

2 Robben Island Snakes (*Coronella phocarum*) From Robben Island. Presented by the Rev. G. H. R. Fisk, C.M.Z.S.

1 Hoary Snake (*Coronella cana*). From Wynberg, Cape Colony. Presented by the Rev. G. H. R. Fisk, C.M.Z.S.

3 Purplish Geckos (*Phyllodactylus porphyreus*). From Cape Colony. Presented by the Rev. G. H. R. Fisk, C.M.Z.S.

1 Smooth-bellied Snake (*Homalosoma lutrix*). From Cape Colony. Presented by the Rev. G. H. R. Fisk, C.M.Z.S.

9. 1 Macaque Monkey (*Macacus cynomolgus*), ♂. Presented by James B. Leckie. Esq.

2 Elliot's Pheasants (*Phasianus ellioti*), 2 ♀. Purchased.

2 Rufous Tinamous (*Rhynchotus rufescens*). Purchased.

20 Marbled Newts (*Molge marmorata*). Bred in the Menagerie.

10. 1 Ortolan Bunting (*Emberiza hortulana*), ♀. Purchased.

11. 5 Squirrel-like Phalangers (*Belideus sciureus*), 3 ♂, 2 ♀. Deposited.

1 Green Lizard (*Lacerta viridis*). Presented by Mrs. Hill.

12. 1 White-fronted Amazon (*Chrysotis leucocephala*). Presented by Mrs. Lacàbra.

13. 1 Angolan Vulture (*Gypohierax angolensis*). Purchased.

12 Gallot's Lizards (*Lacerta galloti*). Presented by E. G. Meade-Waldo, Esq., F.Z.S. From Teneriffe.

8 Greenish Sand-Skinks (*Chalcides viridanus*). From Teneriffe. Presented by E. G. Meade-Waldo, Esq., F.Z.S.

1 Delalande's Geckos (*Tarentola delalandii*). From Teneriffe. Presented by E. G. Meade-Waldo, Esq., F.Z.S.

4 Scorpions (*Scorpio*, sp. inc.). From Teneriffe. Presented by E. G. Meade-Waldo, Esq., F.Z.S.

1 Short-nosed Bandicoot (*Perameles obesula*), ♀. Purchased.

1 Grand Eclectus (*Eclectus roratus*). Deposited.

3 Horned Lizards (*Phrynosoma cornutum*). Presented by James E. Talmage, Esq.

15. 3 Stoats (*Mustela erminea*). Presented by J. S. B. Borough, Esq.

1 Burrhel Wild Sheep (*Ovis burrhel*), ♂. Born in the Menagerie.

1 Tawny Eagle (*Aquila nævioides*). From Africa. Presented by K. G. Hay, Esq.

2 Chinese Geese (*Anser cygnoides*), ♂ ♀. Presented by Capt. J. W. Creaghe.

2 Impeyan Pheasants (*Lophophorus impeyanus*). Bred in the Menagerie.

16. 1 Bennett's Wallaby (*Halmaturus bennetti*), ♂. Born in the Menagerie.

June 16. 2 Abyssinian Guinea-fowl (*Numida ptilorhyncha*). Deposited.
17. 1 Ocelot (*Felis pardalis*), ♂. Presented by Sir Henry Blake, K.C.M.G.
1 Red-tailed Buzzard (*Buteo borealis*). Presented by Sir Henry Blake, K.C.M.G.
1 Laughing Gull (*Larus atricilla*). From the West Indies. Presented by Sir Henry Blake, K.C.M.G.
2 Heloderms (*Heloderma suspectum*). Deposited.
18. 1 Goat (*Capra*, sp. inc.), ♀. Presented by C. V. Creagh, Esq.
1 Vinaceous Amazon (*Chrysotis vinacea*). Purchased.
1 Blue-fronted Amazon (*Chrysotis leucocephala*). Presented by Mrs. A. G. Nussey.
19. 1 Grey-breasted Parrakeet (*Bolborhynchus monachus*). Presented by Mr. J. R. George.
1 Chinese Goose (*Anser cygnoides*). Presented by J. Wightman, Esq.
1 Blossom-headed Parrakeet (*Palæornis cyanocephalus*). Deposited.
1 Meyer's Parrot (*Pœocephalus meyeri*). Deposited.
20. 3 Tibetan Crossoptilons (*Crossoptilon tibetanum*), 2 ♂, 1 ♀. From Western China. Purchased. See P. Z. S. 1891, p. 464.
1 Temminck's Tragopan (*Ceriornis temmincki*), ♂. From Western China. Purchased.
1 Collar-less Pheasant (*Phasianus decollatus*). From Western China. Purchased.
4 Common Quails (*Coturnix communis*), 3 ♂, 1 ♀. Presented by J. C. Gie, Esq.
2 Mule Deer (*Cariacus macrotus*), ♂ ♀. Born in the Menagerie.
22. 1 American Red Fox (*Canis fulvus*). Presented by Mr. W. Reading.
1 Derbian Wallaby (*Halmaturus derbianus*), ♂. Born in the Menagerie.
3 Common Night-Herons (*Nycticorax griseus*). Born in the Menagerie.
23. 1 Sinaitic Ibex (*Capra sinaitica*), ♀. Presented by Sir James Anderson. From the Erba Mountains, 120 miles N. of Suakim. See P. Z. S. 1891, p. 464.
1 Rhesus Monkey (*Macacus rhesus*), ♀. Presented by Mr. Albert Job.
24. 1 Two-spotted Paradoxure (*Nandinia binotata*). Presented by E. G. Parkinson, Esq.
2 White-headed Sea-Eagles (*Haliaetus leucocephalus*). Received in Exchange.
25. 2 Gaimard's Rat-Kangaroos (*Hypsiprymnus gaimardi*), 2 ♀. Presented by Walter Howker, Esq.
1 Burchell's Zebra (*Equus burchelli*), ♂. Born in the Menagerie.
26. 1 Cuckoo (*Cuculus canorus*). Presented by V. S. Marks, Esq.
2 Red-billed Tree-Ducks (*Dendrocygna autumnalis*). Presented by — Keswick, Esq.
1 Common Viper (*Vipera berus*). Presented by Mr. J. Sargeant.
27. 1 White-faced Tree-Duck (*Dendrocygna viduata*). Presented by Capt. C. A. Findlay, R.N.R., ss. 'Ruapehu.'
30. 1 Duyker-Bok (*Cephalophus mergens*), ♂. Presented by A. Barsdorf, Esq.

July 1. 1 Orange-cheeked Waxbill (*Estrelda melpoda*). Presented by Mrs. Harris.
1 Zebra Waxbill (*Estrelda subflava*). Presented by Mrs. Harris.
1 Nutmeg Finch (*Munia punctularia*, var.). Presented by Mrs. Harris.
1 Common Viper (*Vipera berus*). Presented by W. H. B. Pain, Esq.
2. 5 West-Indian Agoutis (*Dasyprocta cristata*). Presented by the Board of Guardians of the Institute of Jamaica.
1 Spotted Cavy (*Cœlogenys paca*). Presented by R. Kirk, Esq.
3. 1 Chimpanzee (*Anthropopithecus troglodytes*), ♂. Presented by Major Al. McDonnell Moore.
1 Chattering Lory (*Lorius garrulus*). Presented by Miss Alice Dundas.
2 Slow Loris (*Nycticebus tardigradus*). Presented by R. Dickson, Esq.
1 Javan Fish-Owl (*Ketupa javanensis*). Presented by R. Dickson, Esq.
4 Grey Parrots (*Psittacus erithacus*). Deposited.
1 Thar (*Capra jemlaica*), ♂. Born in the Menagerie.
4. 2 Turtle-Doves (*Turtur communis*). Presented by E. W. H. Blagg, Esq.
1 Huanaco (*Lama huanacos*), ♂. Presented by Messrs. J. Fallows and J. D. Wallace. From the Province of Rioja, Argentine Republic.
6. 2 Senegal Touracous (*Corythaix pensa*). Presented by Sir Brandforth Griffith, Bart.
8. 2 Mule Deer (*Cariacus macrotis*), 2 ♂. Born in the Menagerie.
2 Rock-Thrushes (*Monticola saxatilis*). Presented by the Rev. Hubert D. Astley.
3 Summer Ducks (*Æx sponsa*). Bred in the Menagerie.
5 Chilian Pintail (*Dafila spinicauda*). Bred in the Menagerie.
7 Mandarin Ducks (*Æx galericulata*). Bred in the Menagerie.
2 Australian Wild Ducks (*Anas superciliosa*). Bred in the Menagerie.
1 Spotted-billed Duck (*Anas pœcilorhyncha*). Bred in the Menagerie.
9. 1 Macaque Monkey (*Macacus cynomolgus*). Presented by R. Armstrong, Esq.
10. 2 Larger Hill-Mynahs (*Gracula intermedia*). Deposited.
1 Half-collared Owl (*Scops semitorques*). Presented by J. de la Touche, Esq.
13. 1 Burrhel Wild Sheep (*Ovis burrhel*), ♂. Born in the Menagerie.
14. 1 Japanese Deer (*Cervus sika*), ♀. Born in the Menagerie.
15. 2 Ruddy-headed Geese (*Bernicla rubidiceps*), ♂. Presented by F. E. Blaauw, Esq., C.M.Z.S.
16. 2 Night-Herons (*Nycticorax griseus*). Bred in the Menagerie.
1 Smooth Snake (*Coronella lævis*). Presented by W. H. B. Pain, Esq.
17. 2 Great Eagle-Owls (*Bubo maximus*). Deposited.
18. 6 Eyed Lizards (*Lacerta ocellata*). Purchased.
2 Four-lined Snakes (*Coluber quadrilineatus leopardinus*). Purchased.
1 Back-marked Snake (*Rhinechis scalaris*). Purchased.

July 19. 1 Bennett's Wallaby (*Halmaturus bennetti*), ♀. Born in the Menagerie.

20. 1 Silver-backed Fox (*Canis chama*), ♂. Presented by Max Michaelis, Esq.

2 Pennsylvanian Buzzards (*Buteo pennsylvanicus*). Presented by the Hon. Sir W. Francis Hely-Hutchison, K.C.M.G. From Grenada, W. I.

21. 1 Ring-tailed Coati (*Nasua rufa*). Presented by J. Smalman Smith, Esq.

1 Azara's Agouti (*Dasyprocta azaræ*). Purchased.

22. 2 Rough Foxes (*Canis rudis*). From British Guiana. Presented by G. H. Hawtayne, Esq., C.M.Z.S.

1 Rough Fox (*Canis rudis*). From British Guiana. Presented by Capt. Arnot.

1 Tigrine Cat (*Felis tigrina*). Deposited.

1 Golden Agouti (*Dasyprocta aguti*). From British Guiana. Presented by Capt. Arnot.

2 Spotted Cavies (*Cœlogenys paca*). From British Guiana. Presented by Capt. Arnot.

1 Crab-eating Opossum (*Didelphys cancrivora*). Deposited.

1 Blue-and-Yellow Macaw (*Ara ararauna*). Deposited.

1 Red-and-Yellow Macaw (*Ara chloroptera*). Deposited.

2 Orange-winged Amazons (*Chrysotis amazonica*). Deposited.

1 Yellow-fronted Amazon (*Chrysotis ochrocephala*). Deposited.

1 Hawk-headed Parrot (*Deroptyus accipitrinus*). Deposited.

1 Common Trumpeter (*Psophia crepitans*). Deposited.

2 West-Indian Rails (*Aramides cayennensis*). From British Guiana. Presented by Capt. Arnot.

1 Martinique Gallinule (*Ionornis martinicus*). Deposited.

23. 1 White-lipped Peccary (*Dicotyles labiatus*). Deposited.

2 Common Goats (*Capra hircus*). Deposited.

3 Crested Curassows (*Crax alector*). From British Guiana. Presented by Capt. Arnot.

24. 1 Barn-Owl (*Strix flammea*). Presented by E. Hart, Esq., F.Z.S.

1 White-fronted Capuchin (*Cebus albifrons*). Presented by the Earl of Carnarvon.

26. 1 Macaque Monkey (*Macacus cynomolgus*). Presented by Mr. G. Stevenson Macfarlane.

27. 1 Laughing Kingfisher (*Dacelo gigantea*). Deposited.

28. 2 Nilotic Crocodiles (*Crocodilus vulgaris*). Presented by Dr. Lester.

1 Pleurodele Newt (*Molge walti*). Presented by Miss C. C. Hopley.

29. 1 Banded Ichneumon (*Herpestes fasciatus*). Presented by Dr. Arthur Williams.

30. 2 King Parrakeets (*Aprosmictus scapulatus*). Purchased.

2 Black Storks (*Ciconia nigra*). Purchased.

1 Black Stork (*Ciconia nigra*). Presented by Lord Lilford, F.Z.S.

Aug. 1. 1 Cuckoo (*Cuculus canorus*). Presented by Master R. Small.

3. 2 Slowworms (*Anguis fragilis*). Presented by Messrs. F. East and E. Johnson.

1 Lesser Sulphur-crested Cockatoo (*Cacatua sulphurea*). Presented by Miss Partridge.

5. 1 Grey Parrot (*Psittacus erithacus*). Deposited.

Aug. 5. 2 Grey Ichneumons (*Herpestes griseus*). Presented by H. E. Lindsay, Esq.
2 Golden Paradoxures (*Paradoxurus zeylanicus*). Presented by H. E. Lindsay, Esq.
1 Indian Cobra (*Naia tripudians*). Presented by H. E. Lindsay Esq.
1 Agile Wallaby (*Halmaturus agilis*). Presented by G. Skelton Streeter, Esq.
6. 2 Barbary Turtle-Doves (*Turtur risorius*). Presented by Miss Dolly Bason.
3 Grey Parrots (*Psittacus erithacus*). Deposited.
2 Harnessed Antelopes (*Tragelaphus scriptus*), ♂ ♀. Presented by R. B. Llewelyn, Esq., C.M.G.
7. 1 Egyptian Gazelle (*Gazella dorcas*), ♀. Presented by Capt. S. C. Saunders. From Tunis.
1 Ring-tailed Coati (*Nasua rufa*). Presented by Edward J. Brown, Esq.
2 Herring-Gulls (*Larus argentatus*). Presented by T. A. Cotton, Esq.
8. 2 White-bellied Sea-Eagles (*Haliaetus leucogaster*). Presented by Hugh Nevill, Esq., F.Z.S.
10. 1 Common Otter (*Lutra vulgaris*), ♀. Presented by D. E. Cardinall, Esq.
1 Marbled Polecat (*Putorius sarmaticus*). Presented by Col. C. Shepherd. From Quetta, Beluchistan.
1 Golden Eagle (*Aquila chrysaetus*). From the Atlas. Presented by Capt. Taylor.
11. 1 Vulpine Squirrel (*Sciurus vulpinus*). Presented by Miss Pickford.
7 Lemmings (*Myodes lemmus*). From Norway. Presented by T. T. Somerville, Esq.
2 Sparrow-Hawks (*Accipiter nisus*). Presented by Digby S. W. Nicholl, Esq., F.Z.S.
3 Japanese Green Finches (*Fringilla kawarahibi*). Presented by F. E. Blaauw, Esq., C.M.Z.S.
12. 1 Brown Capuchin (*Cebus fatuellus*), ♀. Presented by Miss Phyllis Duncan.
1 Yak (*Poëphagus grunniens*), ♀. Born in the Menagerie.
13. 10 Andalucian Short-toed Larks (*Calandrella bætica*). Deposited.
1 Common Chameleon (*Chamæleon vulgaris*). Presented by Capt. Wood.
1 Dwarf Chameleon (*Chamæleon pumilis*). Presented by Capt. Wood.
2 Common Chameleons (*Chamæleon vulgaris*). Presented by E. Palmer, Esq.
14. 2 Undulated Grass-Parrakeets (*Melopsittacus undulatus*). Received in Exchange.
1 West-Indian Agouti (*Dasyprocta cristata*). From Trinidad. Presented by R. J. L. Guppy, Esq., C.M.Z.S.
1 Golden Agouti (*Dasyprocta aguti*). From Trinidad. Presented by R. J. L. Guppy, Esq., C.M.Z.S.
2 Violet Tanagers (*Euphonia violacea*), ♂ ♀. Presented by R. J. L. Guppy, Esq., C.M.Z.S.
1 Red-bellied Squirrel (*Sciurus variegatus*). Presented by R. J. L. Guppy, Esq., C.M.Z.S.
1 Egyptian Ichneumon (*Herpestes ichneumon*). Deposited.

Aug. 15. 1 Grey Parrot (*Psittacus erythacus*). Presented by Mrs. Hale.
17. 4 Leopard Tortoises (*Testudo pardalis*). From the Cape. Presented by the Rev. G. H. R. Fisk, C.M.Z.S.
3 Angulated Tortoises (*Chersina angulata*). From the Cape. Presented by the Rev. G. H. R. Fisk, C.M.Z.S.
1 Galeated Pentonyx (*Pelomedusa galeata*). From the Cape. Presented by the Rev. G. H. R. Fisk, C.M.Z.S.
1 Hoary Snake (*Coronella cana*). From the Cape. Presented by the Rev. G. H. R. Fisk, C.M.Z.S.
1 Robben-Island Snake (*Coronella phocarum*). From the Cape. Presented by the Rev. G. H. R. Fisk, C.M.Z.S.
2 Water-Vipers (*Cenchris piscivora*). Deposited.
19. 5 White-eared Conures (*Conurus leucotis*). Presented by Mrs. Arthur Smithers.
20. 1 Common Fox (*Canis vulpes*). Presented by Capt. H. S. Tunnard.
21. 1 Gold Pheasant (*Thaumalea picta*), ♀. Presented by R. Hudson, Esq.
2 Alligators (*Alligator mississippiensis*). Presented by Charles Downs, Esq.
1 Pig-tailed Monkey (*Macacus nemestrinus*), ♂. Deposited.
22. 1 Grey Lemur (*Hapalemur griseus*). Purchased.
24. 1 Macaque Monkey (*Macacus cynomolgus*), ♀. Presented by Mr. H. Wother.
1 Pinche Monkey (*Midas œdipus*), ♂. Presented by Mr. H. Wother.
1 Greater Sulphur-crested Cockatoo (*Cacatua galerita*). Deposited.
25. 1 Smooth Snake (*Coronella lævis*). Presented by F. C. Adams, Esq.
1 Roseate Cockatoo (*Cacatua roseicapilla*). Presented by Mrs. Amy Jones, F.Z.S.
27. 1 Punctured Salamander (*Amblystoma punctatum*). Presented by J. H. Thomson, Esq., Ph.D.
28. 1 Thick-necked Tree-Boa (*Epicrates cenchris*). From Trinidad. Presented by Messrs. R. R. Mole and F. W. Urich.
1 Marbled Polychrus (*Polychrus marmoratus*). From Trinidad. Presented by Messrs. R. R. Mole and F. W. Urich.
29. 1 Slender-billed Cockatoo (*Licmetis tenuirostris*). Presented by Miss Caplen.
30. 1 Black-faced Kangaroo (*Macropus melanops*), ♂. Deposited.
1 Grey Parrot (*Psittacus erithacus*). Deposited.
31. 1 Australian Thicknee (*Œdicnemus grallarius*). Presented by Sir Ferdinand von Mueller, K.C.M.G., F.R.S., C.M.Z.S.

Sept. 3. 2 Many-zoned Hawks (*Melierax polyzonus*). Presented by Capt. Thomas Hay.
1 Dorsal Hyrax (*Hyrax dorsalis*). From Sierra Leone. Presented by C. B. Mitford, Esq. See P. Z. S. 1891, p. 465.
1 Ring-necked Parrakeet (*Palæornis torquatus*). Presented by Mrs. Bowen.
4. 1 Manx Shearwater (*Puffinus anglorum*). Presented by Master Riviere.
1 Common Polecat (*Mustela putorius*). Presented by F. D. Lea Smith, Esq.
7. 1 Fallow Deer (*Dama vulgaris*), ♂. Presented by J. Johnston, Esq.

Sept. 7. 1 Common Cormorant (*Phalacrocorax carbo*). Purchased.
8. 1 Persian Gazelle (*Gazella subgutturosa*), ♀. Presented by Baron Ferdinand de Rothschild.
2 Yellow-browed Buntings (*Emberiza chrysophrys*). Purchased.
2 Red-backed Buntings (*Emberiza rutila*). Purchased.
1 Bonaparte's Bunting (*Emberiza ciopsis*). Purchased.
2 Japanese Greenfinches (*Fringilla kawarahibi*, var.). Purchased.
11. 2 Pinche Monkeys (*Midas œdipus*), ♂ ♀. Presented by Mr. A. Aitken.
1 Yellow-footed Rock-Kangaroo (*Petrogale xanthopus*), ♀. Born in the Menagerie.
15. 1 Macaque Monkey (*Macacus cynomolgus*), ♀. Presented by G. H. Sasse, Esq.
1 Otter (*Lutra vulgaris*). Received in Exchange.
3 Indian Pythons (*Python molurus*). Deposited.
1 Rhomb-marked Snake (*Psammophylax rhombeatus*). From South Africa. Presented by Messrs. Herbert M. and Claude Beddington.
4 Crossed Snakes (*Psammophis crucifer*). From South Africa. Presented by Messrs. Herbert M. and Claude Beddington.
1 Hygian Snake (*Elaps hygiæ*). From South Africa. Presented by Messrs. Herbert M. and Claude Beddington.
2 Rough-keeled Snakes (*Dasypeltis scabra*). From South Africa. Presented by Messrs. Herbert M. and Claude Beddington.
16. 1 Macaque Monkey (*Macacus cynomolgus*), ♂. Purchased.
1 Pardine Genet (*Genetta pardina*). Purchased.
2 White-tailed Sea-Eagles (*Haliaëtus albicilla*, jr.). Deposited.
1 Vinaceous Turtle-Dove (*Turtur vinaceus*). Bred in the Menagerie.
17. 1 Mozambique Monkey (*Cercopithecus rufoviridis*). Presented by Keith Anstruther, Esq. From Kilimanjaro, E. Africa. See P. Z. S. 1891, p. 465.
1 Garnett's Galago (*Galago garnetti*). Presented by Keith Anstruther, Esq. From Kilimanjaro, E. Africa.
1 Blotched Genet (*Genetta tigrina*). Presented by Keith Anstruther, Esq. From Taveta, E. Africa.
1 Somali Ostrich (*Struthio camelus molybdophanes*), ♀. Presented by Keith Anstruther, Esq. From Taveta, E. Africa. See P. Z. S. 1891, p. 465.
2 Sykes's Monkeys (*Cercopithecus albigularis*), ♂ ♀. Presented by Fredk. Pardage, Esq.
1 Macaque Monkey (*Macacus cynomolgus*), ♂. Presented by Mrs. Gregory.
1 Coypu (*Myopotamus coypus*), ♀. Presented by Spencer H. Curtis, Esq.
1 Golden Eagle (*Aquila chrysaetus*). Presented by Hubert Bray, Esq.
18. 1 Levaillant's Cynictis (*Cynictis levaillanti*). Purchased.
1 Occipital Elaps (*Elaps occipitalis*). Presented by Mr. E. H. Meek.
1 Smooth Snake (*Coronella lævis*). Presented by A. W. S. Fisher, Esq.
2 Common Snakes (*Tropidonotus natrix*). Presented by A. W. S. Fisher, Esq.

Sept. 19. 2 Madeiran Pigeons (*Columba trocaz*). Deposited.
1 Namaqua Sand-Grouse (*Pterocles namaqua*). Presented by Max Michaelis, Esq.
21. 2 Rough-faced Shags (*Phalacrocorax carunculatus*). Presented by the Earl of Onslow, G.C.M.G. See P. Z. S. 1891, p. 465.
22. 1 Vervet Monkey (*Cercopithecus lalandii*), ♀. Presented by Capt. R. C. Stevenson.
1 White-fronted Lemur (*Lemur albifrons*), ♀. Presented by Capt. R. C. Stevenson.
2 Blackcaps (*Sylvia atricapilla*), ♂ ♀. Presented by J. Young, Esq., F.Z.S.
2 Lesser White-throats (*Sylvia curruca*). Presented by J. Young, Esq., F.Z.S.
2 Goldfinches (*Carduelis elegans*). Presented by J. Young, Esq., F.Z.S.
1 Marsh-Tit (*Parus palustris*). Presented by J. Young, Esq., F.Z.S.
23. 1 Solitary Thrush (*Monticola cyanus*). Deposited.
24. 2 Thirteen-striped Sousliks (*Spermophilus* xiii-*lineatus*), ♂ ♀. From North America. Purchased.
3 Common Vipers (*Vipera berus*). Presented by Messrs. A. F. R. and F. E. R. Wollaston.
1 Sharpe's Wood-Owl (*Syrnium nuchale*). Purchased.
1 Ruddy-headed Goose (*Bernicla rubidiceps*), ♂. Received in Exchange.
1 Testaceous Snake (*Ptyas testacea*). Purchased.
25. 1 Golden Agouti (*Dasyprocta aguti*). Presented by Frank Fisher, Esq. From Surinam.
1 Garden's Night-Heron (*Nycticorax gardeni*). Presented by Frank Fisher, Esq. From Surinam.
1 Agami Heron (*Ardea agami*). Presented by Frank Fisher, Esq. From Surinam. See P. Z. S. 1891, p. 465.
1 Common Paradoxure (*Paradoxurus typus*). Presented by Miss Bason.
1 Sambur Deer (*Cervus aristotelis*). Born in the Menagerie.
26. 1 Macaque Monkey (*Macacus cynomolgus*), ♀. Deposited.
28. 1 Indian Civet (*Viverricula malaccensis*). Presented by Hubert Courtney Hodson, Esq.
2 Grey-breasted Parrakeets (*Bolborhynchus monachus*). Presented by J. C. Wallace, Esq.
2 Nightingales (*Daulias luscinia*). Presented by J. Young, Esq., F.Z.S.
2 Common Whitethroats (*Sylvia cinerea*). Presented by J. Young, Esq., F.Z.S.
1 Blackcap (*Sylvia atricapilla*), ♀. Presented by J. Young, Esq., F.Z.S.
30. 2 Quebec Marmots (*Arctomys monax*). Purchased.
2 Chilian Sea-Eagles (*Geranoaëtus melanoleucus*). From Chili. Presented by H. Berkeley James, Esq., F.Z.S.

Oct. 1. 4 Yellow Wagtails (*Motacilla raii*). Presented by Mr. W. Swaysland.
15 Striped Snakes (*Tropidonotus sirtalis*). Presented by John Gray, Esq.
2. 1 Common Cormorant (*Phalacrocorax carbo*). Presented by F. T. Barry, Esq., M.P.
2 Scaly Doves (*Scardafella squamosa*). Purchased.

Oct. 2. 2 Grey Ground-Doves (*Peristera cinerea*). Purchased.
1 Red under-winged Dove (*Leptoptera rufaxilla*). Purchased.
3. 1 Macaque Monkey (*Macacus cynomolgus*), ♀. Presented by Mrs. Gwynne.
2 Hudson's-Bay Squirrels (*Sciurus hudsonius*). Purchased.
5. 1 Macaque Monkey (*Macacus cynomolgus*), ♂. Presented by J. Barrett Lennard, Esq.
1 Rhesus Monkey (*Macacus rhesus*), ♀. Presented by Miss Corrie Chisholm.
6. 1 Molucca Deer (*Cervus moluccensis*). Born in the Menagerie.
8. 1 Gannet (*Sula bassana*). Presented by Dr. Davis.
1 Common Chameleon (*Chamæleon vulgaris*). Presented by F. Manners, Esq.
9. 11 Gold Pheasants (*Thaumalea picta*), ♂. Presented by Edwin J. Poyser, Esq.
2 Amherst Pheasants (*Thaumalea amherstiæ*), ♂. Presented by Edwin J. Poyser, Esq.
2 Silver Pheasants (*Euplocamus nycthemerus*), ♂ ♀. Presented by Edwin J. Poyser, Esq.
1 Common Pheasant (*Phasianus colchicus*), ♂. Presented by Edwin J. Poyser, Esq.
4 Ruddy Sheldrakes (*Tadorna casarca*). Presented by Edwin J. Poyser, Esq.
10. 1 Macaque Monkey (*Macacus cynomolgus*), ♂. Deposited.
2 Common Marmosets (*Hapale jacchus*). Presented by Mrs. Fredk. Betts.
2 Bernicle Geese (*Bernicla leucopsis*). Presented by Cecil Smith, Esq.
2 Brent Geese (*Bernicla brenta*). Presented by Cecil Smith, Esq.
12. 1 Silver Pheasant (*Euplocamus nycthemerus*), ♂. Presented by J. Hitchman, Esq., M.D.
1 Smooth Snake (*Coronella lævis*). Presented by F. C. Adams, Esq.
13. 1 Common Marmoset (*Hapale jacchus*). Presented by Miss Trelawney.
10 Smooth Snakes (*Coronella lævis*). Born in the Menagerie.
14. 1 Macaque Monkey (*Macacus cynomolgus*). Presented by Mrs. Cotton.
15. 1 Gannet (*Sula bassana*). Presented by R. Philpot, Esq.
17. 1 Bonnet Monkey (*Macacus sinicus*), ♂. Presented by W. Harrow, Esq.
19. 1 Lion Marmoset (*Midas rosalia*), ♂. Received in Exchange.
21. 1 White-fronted Lemur (*Lemur albifrons*), ♂. Presented by J. M. Nicoll, Esq.
1 Macaque Monkey (*Macacus cynomolgus*), ♀. Deposited.
1 Buffon's Skua (*Stercorarius parasiticus*). Presented by E. Hart, Esq., F.Z.S. See P. Z. S. 1891, p. 486.
1 Cuckoo (*Cuculus canorus*). Presented by H. Lindsay, Esq.
22. 1 Australian Cassowary (*Casuarius australis*). Deposited.
23. 1 Burbot (*Lota vulgaris*). Presented by T. F. Burrows, Esq.
24. 1 Ring-tailed Coati (*Nasua rufa*). Presented by A. D. Watson, Esq., R.N.
1 Common Cuckoo (*Cuculus canorus*). Presented by Miss Ord.
1 Land-Crab (*Geocarcinus ruricola*). Presented by D. Wilson-Barker, Esq., F.Z.S. From the Island of Fernando de Noronha. See P. Z. S. 1891, p. 486.

Oct. 26. 1 Molucca Deer (*Cervus moluccensis*), ♂. Born in the Menagerie.
1 Corn-Crake (*Crex pratensis*). Presented by E. Hart, Esq., F.Z.S.
2 Water-Vipers (*Cenchris piscivorus*). Presented by the Natural History Society of Toronto. From Florida.
1 Water-Rattlesnake (*Crotalus adamanteus*). Presented by the Natural History Society of Toronto. From Florida.
27. 1 Yak (*Poëphagus grunniens*), ♂. Presented by M. E. C. Ingram, Esq.
1 Rhesus Monkey (*Macacus rhesus*), ♀. Presented by the Rev. Sidney Vatcher.
2 Macaque Monkeys (*Macacus cynomolgus*), ♂ ♀. Presented by the Rev. Sidney Vatcher.
1 Bonnet-Monkey (*Macacus sinicus*), ♀. Presented by the Rev. Sidney Vatcher.
2 Roseate Cockatoo (*Cacatua roseicapilla*). Presented by the Rev. Sidney Vatcher.
1 Greater Sulphur-crested Cockatoo (*Cacatua galerita*). Presented by the Rev. Sidney Vatcher.
2 Cockateels (*Calopsitta novæ-hollandiæ*). Presented by the Rev. Sidney Vatcher.
1 Woodcock (*Scolopax rusticula*). From Norfolk. Presented by Hamon Le Strange, Esq., F.Z.S.
28. 2 Rhesus Monkeys (*Macacus rhesus*), 2 ♂. Presented by John H. Taylor, Esq.
2 Bearded Vultures (*Gypaetus barbatus*). From India. Deposited.
1 Mississippi Alligator (*Alligator mississippiensis*). Presented by W. Chattaway, Esq.
1 Small-scaled Mastigure (*Uromastix microlepis*). Presented by Mrs. Howell.
30. 1 Macaque Monkey (*Macacus cynomolgus*), ♂. Presented by K. A. Williams, Esq.
1 Woodcock (*Scolopax rusticula*). Captured in Duke Street, London. Presented by Mr. William Bellamy.
5 Coqui Francolins (*Francolinus coqui*). Deposited.
3 Siskins (*Chrysomitris spinus*), 2 ♂, 1 ♀. Purchased.
2 Lesser Redpolls (*Linota rufescens*), ♂ ♀. Purchased.

Nov. 2. 2 Senegal Touracous (*Corythaix persa*). Presented by J. B. Elliott, Esq.
1 Madagascar Porphyrio (*Porphyrio madagascariensis*). Presented by J. B. Elliott, Esq.
3. 1 Macaque Monkey (*Macacus cynomolgus*), ♂. Presented by G. E. Lidiard, Esq.
1 Pale Black-headed Caique (*Caica melanocephala pallida*). Purchased.
4. 1 Tree-Boa (*Corallus hortulanus*). From British Guiana. Presented by J. J. Quelch, Esq., C.M.Z.S.
1 Black-headed Caique (*Caica melanocephala*). Deposited.
5. 2 Tree-Boas (*Corallus hortulanus*). Presented by H.E. the Hon. Sir Walter F. Hely-Hutchinson, K.C.M.G. From St. Vincent, W. I.
1 Boddaert's Snake (*Coluber boddaerti*). Presented by H.E. the Hon. Sir Walter F. Hely-Hutchinson, K.C.M.G. From St. Vincent, W. I.

Nov. 5. 1 Red-and-Blue Macaw (*Ara macao*). Deposited.
6. 1 Blue-fronted Amazon (*Chrysotis æstiva*). Presented by Mrs. H. R. Warmington.
7. 2 Puff-Adders (*Vipera arietans*). Presented by Messrs. Herbert and Claude Beddington.
1 Black-headed Lemur (*Lemur brunneus*), ♀. Deposited.
8. 1 Brown Capuchin (*Cebus fatuellus*). Deposited.
9. 2 Tuberculated Tortoises (*Homopus femoralis*). Presented by the Rev. G. H. R. Fisk, C.M.Z.S. From Sterkstroom, S. Africa.
10. 2 White-tailed Sea-Eagles (*Haliaëtus albicilla*). Purchased.
2 Pink-footed Geese (*Anser brachyrhynchus*). Presented by Cecil Smith, Esq., F.Z.S.
11. 1 Macaque Monkey (*Macacus cynomolgus*), ♂. Presented by Mr. James Hammond.
17. 1 Bonnet-Monkey (*Macacus sinicus*), ♀. Presented by J. Robinson, Esq.
18. 1 Rhesus Monkey (*Macacus rhesus*), ♀. Presented by Mrs. K. Clark-Ourry.
19. 1 Macaque Monkey (*Macacus cynomolgus*), ♀. Presented by Capt. J. F. C. Hamilton.
4 Spotted-billed Pelicans (*Pelecanus manillensis*). From British India. Purchased. See P. Z. S. 1892, p. 1.
20. 2 Black-necked Hemipodes (*Turnix nigricollis*), ♂ ♀. Purchased.
1 Greater Sulphur-crested Cockatoo (*Cacatua galerita*). Presented by H.G. the Duchess of Sutherland.
1 Bronze-winged Pigeon (*Phaps chalcoptera*), ♂. Purchased.
1 Blood-breasted Pigeon (*Phlogœnas cruentata*), ♀. Purchased.
21. 2 Orang-outangs (*Simia satyrus*), ♂. Deposited.
1 Laughing Falcon (*Herpetotheres cachinnans*). Deposited.
26. 2 Brown Thrushes (*Turdus leucomelas*). Purchased.
1 Vulpine Phalanger (*Phalangista vulpina*), ♀. Born in the Menagerie.
27. 1 Barbary Mouse (*Mus barbarus*). Purchased.
28. 1 Spanish Blue Magpie (*Cyanopolius cooki*). Purchased.
30. 1 Rough-faced Shag (*Phalacrocorax carunculatus*). Deposited.
1 Rough-faced Shag (*Phalacrocorax carunculatus*). Presented by Capt. Salvin.

Dec. 1. 1 Formosan Fruit-Bat (*Pteropus formosus*). From Formosa. Presented by Thos. Perkins, Esq., F.Z.S. See P. Z. S. 1892, p. 1.
1 Little Grebe (*Tachybaptes fluviatilis*). Presented by Mr. T. E. Gunn.
1 Tuatera Lizard (*Sphenodon punctatus*). Presented by Mr. W. King.
3 Carpet Snakes (*Morelia variegata*). Received in Exchange.
2. 1 Grey Ichneumon (*Herpestes griseus*), ♂. Presented by Mr. G. F. Hawker.
1 Blotched Genet (*Genetta tigrina*). Presented by Edmund R. Boyle, Esq.
3. 1 Brush-tailed Kangaroo (*Petrogale penicillata*), ♂. Purchased.
5. 1 Patagonian Cavy (*Dolichotis patachonica*), ♀. Presented by H. H. Sharland, Esq., F.Z.S.
8. 1 Sooty Mangabey (*Cercocebus fuliginosus*), ♀. Presented by H. L. Dampier, Esq., J.P.

Dec. 8. 1 Rufous-necked Weaver-bird (*Hyphantornis textor*), ♂. Presented by Commander W. M. Latham, R.N., F.Z.S.

9. 18 Grenadier Weaver-birds (*Euplectes oryx*). Presented by R. W. Murray, Esq.

10 Golden-backed Weaver-birds (*Pyromelana aurea*). Presented by R. W. Murray, Esq.

9 Black-capped Weaver-birds (*Hyphantornis nigriceps*). Presented by R. W. Murray, Esq.

4 Red-bellied Waxbills (*Estrelda rubriventris*). Presented by R. W. Murray, Esq.

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4 Dwarf Chameleons (*Chamæleon pumilus*). Presented by R. W. Murray, Esq.

10. 1 White Stork (*Ciconia alba*). Presented by Walter Chamberlain, Esq., F.Z.S.

14. 1 Puma (*Felis concolor*, jr.), ♂. Presented by Thomas Bowers, Esq.

15. 1 Musanga Paradoxure (*Paradoxurus musanga*). Presented by J. Watson, Esq.

1 Northern Mocking-bird (*Mimus polyglottus*), ♂. Presented by Major N. Gosselin.

16. 1 Rhesus Monkey (*Macacus rhesus*), ♂. Presented by Mr. H. Godfrey.

1 Rhesus Monkey (*Macacus rhesus*), ♂. Presented by Dr. Hewitson.

1 Grey Ichneumon (*Herpestes griseus*). Presented by W. Needham, Esq.

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2 Brown Hyænas (*Hyæna brunnea*), ♂ ♀. Purchased.

1 Two-toed Sloth (*Cholopus didactylus*). Purchased.

21. 1 Vervet Monkey (*Cercopithecus lalandii*), ♀. Presented by Mr. J. Parr.

22. 1 Bonnet-Monkey (*Macacus sinicus*), ♂. Presented by the Rev. W. P. Beckett.

26. 2 Red-crested Finches (*Coryphospingus cristatus*), ♂ ♀. Presented by Commander W. M. Latham, R.N., F.Z.S.

1 Black-faced Kangaroo (*Macropus melanops*), ♀. Presented by P. Clark, Esq.

30. 1 Rough-eyed Cayman (*Alligator sclerops*). Presented by Charles Taylor, Esq.

31. 4 Beautiful Grass-Finches (*Poëphila mirabilis*). Purchased.

1 Black-backed Jackal (*Canis mesomelas*). Presented by Mrs. Rennie.

INDEX.

THE END.

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THE ZOOLOGICAL SOCIETY OF LONDON.

This Society was instituted in 1826, under the auspices of Sir Humphrey Davy, Bart., Sir Stamford Raffles, and other eminent individuals, for the advancement of Zoology and Animal Physiology, and for the introduction of new and curious subjects of the Animal Kingdom, and was incorporated by Royal Charter in 1829.

During the period which has elapsed since the opening of the Gardens in the Regent's Park in 1828, a very large number of species of Mammals, Birds, and Reptiles has been obtained, detailed lists of which will be found in the published Catalogues of the Collection. To these were added, in 1853, collections of Fishes and of the Lower Aquatic Animals, both marine and freshwater, and in 1881 a House for the breeding and exhibition of Insects and other Articulata.

Patroness.

HER MAJESTY THE QUEEN.

Vice-Patron.

HIS ROYAL HIGHNESS THE PRINCE OF WALES, K.G.

COUNCIL.

The Society consists of Fellows, and Honorary, Foreign, and Corresponding Members, elected according to the Bye-Laws.

The Gardens in the Regent's Park are open from Nine o'clock A.M. till Sunset; and the Offices and Library (3 Hanover Square, W.), where all communications should be addressed, from Ten till Five, except on Saturdays, when they close at Two o'clock P.M.

The Meetings of the Society for General Business are held at the Office on the Thursday following the third Wednesday in every month of the year, except in September and October, at Four P.M.

The Meetings for Scientific Business are held at the Office twice a month on Tuesdays, except in July, August, September, and October, at half-past Eight o'clock P.M.

The Anniversary Meeting is held on the 29th April, at Four P.M.

TERMS FOR THE ADMISSION OF FELLOWS.

Fellows pay an Admission Fee of £5, and an annual Contribution of £3, due on the 1st of January, and payable in advance, or a Composition of £30 in lieu thereof; the whole payment, including the Admission Fee, being £35.

Fellows elected after the 30th of September are not liable for the Subscriptions for the year in which they are elected.

PRIVILEGES OF FELLOWS.

Fellows have Personal Admission to the Gardens with Two Companions daily, upon signing their names in the book at the entrance gate.

Fellows of the Society receive a Book of Saturday, and a Book of Sunday Orders. These Orders admit *two* persons to the Gardens on each Saturday and *two* on each Sunday in the year. But the Saturday Orders are *not* available if the Fellow uses his privilege of *personally* introducing two companions on the *same day*.

Fellows, if they wish it, can exchange the Book of Saturday Orders for Twenty Tickets, available for any day *during the year of issue*. The Book of Sunday Orders can also be exchanged for a similar packet of Twenty Tickets. These tickets will admit only one person, whether child or adult.

FELLOWS also receive Twenty Free Tickets (Green), each valid for the admission of one adult any day of the week including Sunday. Children's Tickets (Buff) can be had in lieu of Green Tickets in the proportion of two Children's Tickets to one Adult's. These Tickets, if not made use of in the year of issue, are available for following years.

The Books of Orders and the Free Tickets are sent to all FELLOWS who shall have given a General Order for their delivery, on the 1st of January in every year, at any specified address. Forms for this purpose are supplied on application.

The WIFE of a FELLOW can exercise all these privileges in his absence.

FELLOWS have the privilege of receiving a complete set of the Society's Publications on payment of the additional Subscription of One Guinea every year. This Subscription is due upon the 1st of January and must be paid before the day of the Anniversary Meeting, after which the privilege lapses. FELLOWS are likewise entitled to purchase the Transactions and other Publications of the Society at 25 per cent. less than the price charged to the public. A further reduction of 25 per cent. is also made upon all purchases of Publications issued prior to 1871, if above the value of Five pounds.

FELLOWS also have the privilege of subscribing to the Annual Volume of the Zoological Record for a sum of £1, payable on the 1st July in each year, but this privilege only holds good if the subscription is paid before the 1st of December following.

FELLOWS may obtain, on the payment of One Guinea annually, an IVORY TICKET, which will admit a named person of their immediate family, resident in the same house with them, to the Gardens with One Companion daily.

They may also obtain a TRANSFERABLE IVORY TICKET admitting Two Persons, available throughout the whole period of Fellowship, on payment of Ten Pounds in one sum. A second similar ticket may be obtained on payment of a further sum of Twenty Pounds.

Any FELLOW who intends to be absent from the United Kingdom during the space of one year or more, may, upon giving to the Secretary notice in *writing*, have his name placed upon the "dormant list," and will be thereupon exempt from the payment of his annual contribution during such absence.

Any FELLOW, having paid all fees due to the Society, is at liberty to withdraw his name upon giving notice in *writing* to the Secretary.

Persons who wish to become Fellows of the Society are requested to communicate with the undersigned.

PHILIP LUTLEY SCLATER, M.A., PH.D., F.R.S.,
Secretary.

3 Hanover Square, W.,
April 1st, 1892.

MEETINGS

OF THE

ZOOLOGICAL SOCIETY OF LONDON

FOR

SCIENTIFIC BUSINESS.

(AT 3 HANOVER SQUARE, W.)

Session 1891-92.

1892.

TUESDAY, APRIL .. 5		TUESDAY, JUNE 14
" MAY .... 3 and 17		

The Chair will be taken at half-past Eight o'clock in the Evening precisely.

The LIBRARY (under the superintendence of Mr. F. H. WATERHOUSE, Librarian) is open from 10 A.M. to 5 P.M.; on Saturdays to 2 P.M. It is closed in the month of September.

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The Royal Society of New South Wales, Sydney.
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The Union for Natural History of Würtemberg, Stuttgardt.

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The Publications (except in special cases) are sent out direct as soon as they are issued. It is requested that they may be acknowledged by the return of the form of receipt sent with them, in order that any mis-delivery may be brought to notice.

Publications sent in exchange to this Society should be addressed to the Librarian at this Office. It is requested that they may be sent *direct by post*, as much delay is caused by their transmission through booksellers and in other ways.

By order of the Council,

P. L. SCLATER,

Secretary.

3 Hanover Square, London, W.,
April, 1892.

LIST OF THE PUBLICATIONS

OF THE

ZOOLOGICAL SOCIETY OF LONDON.

The scientific publications of the Zoological Society of London are of two kinds—"Proceedings," published in an octavo form, and "Transactions," in quarto.

According to the present arrangements, the "Proceedings" contain not only notices of all business transacted at the scientific meetings, but also all the papers read at such meetings and recommended to be published in the "Proceedings" by the Committee of Publication. A large number of coloured plates and engravings are attached to each annual volume of the "Proceedings," to illustrate the new or otherwise remarkable species of animals described in them. Amongst such illustrations, figures of the new or rare species acquired in a living state for the Society's Gardens are often given.

The "Proceedings" for each year are issued in four parts, on the first of the months of June, August, October, and April, the part published in April completing the volume for the preceding year.

The "Transactions" contain such of the more important communications made to the scientific meetings of the Society as, on account of the nature of the plates required to illustrate them, are better adapted for publication in the quarto form. They are issued at irregular intervals.

Fellows and Corresponding Members, upon payment of a Subscription of One Guinea before the day of the Anniversary Meeting in each year, are entitled to receive all the Society's Publications for the year. They are likewise entitled to purchase the Publications of the Society at 25 per cent. less than the price charged for them to the Public. A further reduction of 25 per cent. is made upon purchases of Publications issued prior to 1871, if they exceed the value of five pounds.

The following is a complete list of the publications of the Society already issued. They may be obtained at the Society's Office (3 Hanover Square, W.), at Messrs. Longmans', the Society's publishers (Paternoster Row, E.C.), or through any bookseller.

[April, 1892.]

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CONTENTS (*continued*).

November 17, 1891 (*continued*).

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LIST OF PLATES.

1891.

PART IV.

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